

Department of the Army
Pamphlet 73-4

Test and Evaluation

Developmental Test and Evaluation Guidelines

Headquarters
Department of the Army
Washington, DC
1 March 1997

Unclassified

SUMMARY of CHANGE

DA PAM 73-4

Developmental Test and Evaluation Guidelines

This new pamphlet provides procedural guidance to implement the policies contained in Army Regulation 73-1, with regard to planning, executing, and reporting developmental test and evaluation (DT&E) in support of the acquisition process. Specifically it--

- o Provides procedural guidance for developing DT&E strategies for materiel systems, for system modifications, and for nondevelopmental items (chap 2).
- o Defines developmental test types and the role of developmental test participants (chap 4).
- o Summarizes the necessary planning and reporting developmental documentation (chap 5).
- o Outlines considerations for planning effective developmental testing, and provides guidance for developing and acquiring test technology (chaps 6 and 7).

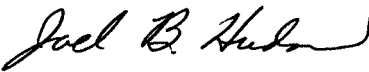
Test and Evaluation

Developmental Test and Evaluation Guidelines

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History. This UPDATE printing publishes a new Department of the Army pamphlet.

Summary. This pamphlet provides procedural guidance to implement the policies in AR 73-1, with regard to planning, executing, and reporting developmental test and evaluation (DT&E) in support of the acquisition process. Specifically, this pamphlet provides procedural guidance for developing DT&E

strategies for materiel systems and developing DT&E strategies for system modifications and nondevelopmental items; defines developmental test types; describes developmental test activities; provides the requirements for DT&E documentation; and provides guidance for developing and acquiring test technology. This pamphlet should be used in conjunction with the other DA pamphlets in the 73-series to provide the user with comprehensive guidance on structuring an effective test and evaluation strategy for use throughout the life cycle of a developmental item.

Applicability. The provisions of this pamphlet apply to the Active Army, the Army National Guard, and the U.S. Army Reserve.

Proponent and exception authority. The proponent of this pamphlet is the Under Secretary of the Army (Operations and Research) (DUSA(OR)). The DUSA(OR) has the authority to approve exceptions to this pamphlet that are consistent with law and controlling regulation. The DUSA(OR) may delegate this approval authority in writing to

a division chief under his or her supervision within the proponent agency who holds the grade of colonel or the civilian equivalent.

Interim changes. See AR 25-30, change 2.

Suggested Improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA, Office of the Chief of Staff of the Army, Test and Evaluation Management Agency (DACSTE), 200 Army Pentagon, Washington D.C. 20310-0200.

Distribution. Distribution of this publication is made in accordance with initial distribution number (IDN) 095493, intended for command levels D and E for the Active Army, the Army National Guard, and the U.S. Army Reserve.

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Chapter 1 Introduction

1-1. Purpose

Developing and deploying Army systems that achieve the required performance and which are operationally effective and suitable represent significant challenges to all involved in the system acquisition process. One of the fundamental elements of the development and acquisition process is test and evaluation (T&E). The structuring and execution of an effective T&E program is absolutely essential to the acquisition and deployment of Army systems which meet user requirements. Implementation of AR 70-1 requires appropriate developmental test and evaluation (DT&E) to be conducted. This pamphlet provides procedures and guidelines for DT&E of all systems developed and managed under the auspices of AR 70-1. (Guidelines for developmental testing of medical materiel are provided in AR 40-60.)

a. This pamphlet provides procedural guidance to implement the policies in AR 73-1, with regard to planning, executing, and reporting DT&E in support of the development and acquisition process. Specifically, this pamphlet provides procedural guidance for developing DT&E strategies for materiel systems and developing DT&E strategies for system changes and nondevelopmental items; defines developmental test types; describes developmental test activities; provides the requirements for DT&E documentation; and provides guidance for developing and acquiring test technology and instrumentation.

b. This pamphlet should be used in conjunction with the other DA pamphlets in the 73-series to provide the user with comprehensive guidance on structuring an effective T&E strategy for use throughout the life cycle of a developmental item.

1-2. References

Required and related publications and prescribed and reference forms are listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and special terms used in this pamphlet are explained in the glossary.

Chapter 2 Developmental Test and Evaluation in the Acquisition Process

Section I Overview

2-1. Developmental test and evaluation

Developmental test and evaluation (DT&E) is conducted throughout the acquisition process to assist in the engineering design and development of a system and to verify that developmental performance specifications have been met.

2-2. Developmental testing

Developmental testing (DT) is conducted to provide data with which to assess compliance with critical technical parameters, identify technological and design risks, and determine readiness to proceed to operational testing. When programs experience technical or operational problems, DT&E provides a valuable service by helping to identify problems and verify fixes before they seriously affect program cost and schedule. A concerted effort is required by the testers, evaluators, and the system developer to mature the equipment technically and properly test it before transitioning to operational testing or the production processes. Developmental testing substantiates the achievement of contractor technical specifications.

a. Developmental testing is a generic term encompassing engineering-type testing, generally requiring instrumentation and measurements, which is accomplished by engineers, technicians, and/or soldier operator-maintainer test and evaluation personnel. It

includes technical feasibility testing, engineering development testing, software development testing, production qualification testing, production verification testing, and testing in support of post-deployment software support.

b. Developmental tests are designed to subject the system or its components, both hardware and software, to stress levels commensurate with those to which the mature system will be subjected in all operating environments. To the degree feasible, tests should be conducted in accordance with the Operational Mode Summary/Mission Profile (OMS/MP). If required, developmental tests may subject the system to stress levels which will estimate the outer limits of the operational envelope. Developmental testing determines the system safety, technical performance, manpower and personnel integration (MANPRINT), human factors performance, reliability, survivability, integrated logistics support (ILS), interoperability with associated equipment, and the integrity of the equipment. A safety release (based on the results of DT) is required before involving soldiers in any test.

c. Chapter 4 contains procedures for requesting developmental test and test support services from Army test facilities.

2-3. Independent developmental evaluation/assessment

The independent developmental evaluator/assessor assists in the engineering design and development and, through the continuous evaluation process, addresses the performance and support requirements, and determines the degree to which the technical parameters of the system have been achieved. The evaluator/assessor optimizes the use of data obtained from models, simulations, and test beds, as well as tests conducted on prototypes or full-scale development models of the system.

2-4. Waivers of approved testing

DT&E which is specified in the approved Test and Evaluation Master Plan (TEMP) must be conducted unless a waiver has been obtained from the TEMP approval authority. Procedures for requesting waivers can be found in AR 73-1, chapter 3.

Section II

Major Developmental Test and Evaluation Actions during the Acquisition Cycle: Materiel Systems

2-5. Developmental test and evaluation planning

a. The materiel developer chairs the Test Integration Working Group (TIWG) and works with its members to structure a T&E program concurrently with the acquisition strategy (see DA Pam 73-1, Chapter 8, for TIWG guidelines). Consideration must be given to T&E over the system's entire life cycle. Program planning documents (chap 4) are a source of information to assist the materiel developer and the developmental tester in identifying future resource requirements (for example, personnel, funds, facilities, instrumentation).

b. Before each major decision point, sufficient DT&E must be done to demonstrate reduced acquisition risks and to estimate the capability of the system to meet the critical technical parameters. Developmental test programs will be structured to provide sufficient data to allow evaluation of issues regarding, but not limited to, effectiveness; safety; performance; reliability, availability, maintainability (RAM); and MANPRINT considerations. The developmental independent evaluators/assessors provide the milestone decision authority (MDA) with information that addresses the critical technical parameters, specifying which parameters have been designated as exit criteria. Exit criteria are the specific minimum requirements that must be satisfactorily demonstrated before the program can progress into the next acquisition phase.

c. As requirements are being generated, close interaction is maintained with ongoing technology development programs to ensure focus on critical military needs. Prior to establishment of a program office or approval of a TEMP, research efforts/ tests, including Advanced Technology Demonstrations (ATD) and Advanced Concept Technology Demonstrations (ACTD) may be used to examine

the feasibility of alternative technologies and to expedite technology transition from the laboratory to operational use.

d. Developmental testing is planned and conducted to take full advantage of the existing investment in DOD ranges and other test facilities, whenever practical. Agencies with requirements for developmental, production, or post-production testing of military materiel must use DOD Major Range and Test Facility Base (MRTFB) activities and other DA test facilities instead of establishing in-house capabilities or contracting for testing services. Developmental testing is coordinated with the Test and Evaluation Command (TECOM) or the Space and Strategic Defense Command (SSDC) to maximize the Army's capital investment in its test facilities. This coordination takes place before Milestone (MS) I and facilitates the generation of DT requirements as well as determining the extent and nature of contractor services, if required. Exceptions will be justified in the TEMP (see AR 73-1).

(1) The DA MRTFB is an aggregation of test activities, facilities, ranges, and equipment designed to provide the Army with the best overall military T&E capability. The MRTFB is operated and managed under uniform reimbursement policy. DOD test customers utilizing the MRTFB are required to pay only those costs that are directly identified to the test. The indirect or overhead costs are funded by the MRTFB activity's parent command (see AR 70-69).

(2) The MRTFB and other test and R&D facilities are capital investments designed to provide comprehensive testing capabilities that support all materiel acquisition programs. These facilities have unique capabilities and expertise and offer significant cost benefits to DA test customers.

(3) DA MRTFB activities are: Yuma Proving Ground, AZ; Dugway Proving Ground, UT; U.S. Army Aberdeen Test Center (located at Aberdeen Proving Ground, MD); White Sands Missile Range, NM; U.S. Army Electronic Proving Ground (located at Fort Huachuca, AZ); and Kwajalein Missile Range, U.S. Army Kwajalein Atoll. Appendix B of this pamphlet contains a brief description of the DA test capabilities, including the DA MRTFB activities. DOD 3200.11-D provides a summary of capabilities of the DOD MRTFB.

2-6. Life cycle system management model -- materiel systems

The life cycle system management model (LCSMM) for materiel systems, including phases, milestones, and descriptions of activities can be found in DA Pam 73-1, chapter 4. The following discussion provides DT&E considerations in the LCSMM.

2-7. Concept exploration and definition (Phase 0)

Milestone (MS) 0 approves the conduct of concept studies to examine potential solutions in response to an identified mission need and begins Phase 0. During this phase, the acquisition strategy is developed, the Operational Requirements Document (ORD) is written for each concept being studied, a TIWG is formed (see DA Pam 73-1, chap 3), and a draft TEMP is developed. The developmental tester and the developmental evaluator/assessor, as members of the TIWG, provide input to the TEMP (see DA Pam 73-2).

a. As the ORD and the TEMP are being staffed, the independent developmental evaluator/assessor begins preparation of the Independent Evaluation Plan/Independent Assessment Plan (IEP/IAP), which addresses all aspects of developmental evaluation responsibilities relative to the system. It describes testing issues and those issues which require data from sources other than testing, states technical parameters, identifies data sources, provides the evaluation approach, and identifies program constraints. The IEP/IAP is coordinated with the TIWG members.

b. As issues identified in the IEP/IAP are analyzed and satisfied during the continuous evaluation effort, they are retained and annotated in updates of the IEP/IAP, but are not included in future evaluation efforts unless program changes indicate the issue should be re-evaluated. Those issues requiring additional evaluation are addressed in follow-on evaluation actions in subsequent acquisition

phases. New evaluation issues are added, as appropriate, and data source matrices and test documents are revised accordingly.

c. Technical feasibility tests (TFT) are conducted to explore materiel concepts and refine evaluation issues. The hardware configuration will generally be breadboards, components, subsystems, brassboards, and/or experimental prototypes. TFTs assist in determining safety and establishing system performance specifications and feasibility.

d. The first iteration of the TEMP is approved at MS I, which initiates the development program and approves proceeding into the demonstration and validation phase.

2-8. Demonstration/validation (Phase I)

During this phase, the TIWG updates the test portion of the acquisition strategy, develops integrated plans for T&E, and updates the TEMP which is coordinated and approved by the decision authority at MS II. Once the TEMP is approved, deletion of tests requires a waiver by the TEMP approval authority.

a. The independent developmental evaluator/assessor, as a member of the TIWG updates the IEP/IAP, integrating evaluation requirements. To optimize evaluation, both contractor and government data are shared by the user, developer, and independent evaluator/assessor. The materiel developer is responsible for providing a comprehensive program strategy to obtain all data required by the independent developmental evaluator/assessor.

b. The TIWG members assist in the development of the Integrated Test Program Schedule (ITPS) which identifies the type of tests to be conducted and the number, scope, and schedule of test activities for the system throughout its acquisition process.

c. Testing, modeling, and simulations are conducted as planned in the TEMP. Engineering development tests (EDT) are conducted during this phase to provide data on performance, safety, the achievability of critical technical parameters, the refinement and ruggedization of hardware configurations, and determination of technical risks. The EDT provides data on the system compatibility and interoperability with existing or planned equipment and systems, and the system effects caused by natural and induced environmental conditions during the development phase.

d. The MS II decision approves the development phase of the item, low-rate initial production (LRIP) quantities, and initiates Phase II.

2-9. Engineering and manufacturing development (Phase II)

During the engineering and manufacturing development (EMD) phase, developmental testing supports the hardware (or system) and associated software design through a test-analyze-and-fix (TAAF) approach performed at the component, subsystem, and system level.

a. Phase II developmental tests must demonstrate that the system meets performance requirements, is producible, and is logistically supportable prior to the MS III decision. Test results provide data which do the following: support the identification of technical risk and feasible solutions; examine the operational aspects of support requirements; provide preliminary data on the system's potential operational effectiveness and suitability; support the materiel improvement process; establish contractual compliance including component qualifications; support preliminary assessment of MANPRINT requirements; and support the evaluation of the technical parameters. (See DA Pam 73-7 for details on software T&E of materiel system computer resources.)

b. During this phase, a production prove-out test (PPT) may be conducted prior to production testing to determine the most appropriate design alternative.

c. Command, control, communications, computer, and intelligence (C4I) systems with DOD certification requirements will undergo testing for compatibility, interoperability, and integration.

d. A logistics demonstration may be done to evaluate the achievement of maintainability goals and the adequacy and sustainability of tools, test equipment, selected test program sets, associated support items of equipment, technical publications,

maintenance instructions, trouble-shooting procedures, and personnel skill requirements. It also addresses the selection and allocation of spare parts, tools, test equipment, and tasks to appropriate maintenance levels, as well as the adequacy of maintenance time standards. The logistics demonstration should be conducted on an engineering prototype for all developmental systems, some non-developmental items (NDI), materiel change items, all new or changed test, measurement, and diagnostic equipment (TMDE), training devices, and support equipment intended for support of the system.

e. During this phase, a system-level production qualification test (PQT) is conducted to ensure design integrity over the specified operational and environmental range. Prior to PQT, the program manager (PM) conducts a developmental test readiness review (DTRR) and issues a developmental test readiness statement (DTRS) which formally certifies that the system is ready for PQT. If required, a Live Fire T&E (LFT&E) may be conducted concurrent with the PQT, which is the final DT done prior to initial operational test (IOT). (For further guidance on LFT&E, see DA Pam 73-6.)

f. A favorable MS III decision is a commitment to type classify, produce, and support the system.

2-10. Production and deployment (Phase III)

Developmental testing conducted during this phase verifies that requirements specified in the technical data package and production contracts are met, and provides test data for the materiel release decision. This phase determines if the production item fulfills the user requirement. It is the soldier's guarantee that performance and quality have not been lost in the transition from development to production.

a. Developmental testing during the production phase of the materiel life cycle is a logical flow-down of pre-MS III tests and includes the testing necessary to verify that requirements specified in technical data packages and production contracts for hardware or software are met. Production testing also provides a baseline for follow-on post-production testing. Production verification tests (PVT) are conducted to verify the production item meets critical technical parameters and contract requirements. The PVT may take the form of a first article test if such testing is required in the technical data package for quality assurance purposes to qualify a new manufacturer or procurements from a previous source out-of-production for a period of time.

b. The interoperability recertification test for C4I systems is conducted if major hardware and software modifications to the system have been made that impact on previously established joint interface requirements.

c. For software intensive materiel systems, developmental tests in support of Post-Deployment Software Support (PDSS) parallel pre-MS III tests, but are usually abbreviated based on the number, magnitude, and complexity of the modifications or maintenance.

d. Follow-on production testing (FPT) may be conducted to verify the adequacy of corrective actions indicated by the PVT. Other production testing includes comparison tests (CPT) and quality conformance (acceptance) inspections.

e. Planning, programming, and budgeting for testing during production will begin early in the development cycle. Funding will be as prescribed in AR 37-100. In general, production items are procured with Procurement, Army (PA) funds, and the procurement of repair parts are Operations and Maintenance, Army (OMA) funded; costs of conducting tests are similarly funded.

f. Provisions will be made in the Research and Development Acquisition Plan (RDAP) for test items, facilities, instrumentation, and resources to support quality assurance testing during production.

g. Criteria for production testing should be prescribed in the appropriate technical data package based upon the performance demonstrated during development or in the contract performance specifications. A description of the test, methods of analysis, and pass/fail criteria will be included. The number of items to be tested and the duration of tests will be based upon sound engineering practices in consideration of costs, schedules, item complexity,

known problem areas, risks (confidence levels), and other factors. Advantage will be taken of prior test data and analytically derived design data in developing the test and sampling plan. Acceptable quality levels will not be used in association with acceptance of materiel from a production contract.

h. The total system is tested during PVT. When individual components and subsystems are tested separately, such testing in itself will not be considered as meeting total system test requirements.

i. Proponent activities should establish procedures to assure the timely planning, testing, reporting, and resolution of deficiencies of newly procured materiel, and to ensure that developmental test requirements are identified to allow appropriate flexibility regarding tests. Among such procedures are:

(1) Tailoring of sample sizes to meet specific contract requirements.

(2) Termination during early testing if performance is so poor that retesting will be required regardless of the results of the remaining portion of the tests.

(3) Reduction, elimination, or early termination of certain tests when there is sufficient evidence that requirements have been demonstrated with high confidence.

2-11. Post-production testing

Post-production testing is conducted to assure that materiel which is stored, reworked, repaired, renovated, or rebuilt after initial issue conforms to specified quality, reliability, safety, MANPRINT, and technical and operational performance standards. (Post-production test types are detailed in section IV, chap 4.)

a. Post-production testing is a follow-on to production testing and includes those surveillance and reconditioning tests required to measure the ability of materiel in the field, in storage, and after maintenance actions (to include repair, rebuild, retrofit, overhaul, and modification) to meet user requirements.

b. After fielding, materiel continues to be tested to be sure that it is holding up in storage and is fully functional, reliable, and operable. Testing is done under conditions that approximate as closely as possible those that would be experienced under actual field conditions.

c. Planning, programming, and budgeting for testing during the post-production phase will begin early in the development cycle. Funding will be as prescribed in AR 37-100. In general, post-production testing, including materiel and cost of tests, will be OMA funded.

d. Surveillance tests are conducted to determine suitability of fielded or stored materiel for use, evaluate the effects of environments, measure deterioration, identify failure modes, and establish or predict service and storage life. Storage sites may include depots, field storage, or extreme environmental locations. Surveillance test programs may be at the component through system level. They include destructive and nondestructive tests. Criteria for surveillance testing will be prescribed in the appropriate technical bulletins (TBs), technical manuals (TMs), storage serviceability standards, and surveillance test program plans.

e. Reconditioning tests include pilot reconditioning tests, initial reconditioning (first article) tests, control (comparison) tests, acceptance tests, and baseline evaluation tests. Criteria for reconditioning testing will be incorporated in depot maintenance work requirements (DMWRs), modification work orders (MWOs), TMs, TBs, and contracts.

f. Test criteria should be based on performance demonstrated during development and production. The number of items to be tested and the duration of tests should be based upon sound engineering practices considering schedules, costs, item complexity, known problem areas, risks (confidence levels), system and software changes made, and other factors. Advantage should be taken of prior test data and analytically derived design data in developing the test and sampling plan. Existing government test facilities will be used rather than building new government or contractor facilities.

Section III

Major Developmental Test and Evaluation Actions during the Acquisition Cycle - Information Systems

2-12. Information system categories

The two categories of information systems, theater/tactical and non-theater/nontactical, are defined in AR 73-1 (para 3-2).

a. Theater/tactical information systems follow the acquisition phases of all information systems, as reflected in DODI 8120.2.

(1) Developmental testing of information systems includes software development tests, software qualification tests, and tests in support of post-deployment software support (PDSS). Software development tests are conducted by the developer on programs and modules. Qualification tests are conducted during Phase II by the government developmental tester at the system level and include a developmental independent evaluation/assessment. Tests during PDSS consist primarily of modifications and maintenance of software.

(2) System-level developmental testing is conducted at stress levels representative of data volumes expected to be encountered under the most extreme circumstances (for example, deployment surge, wartime operation with full force structure participation, and year-end closeout processing). Developmental testing will be structured to estimate the outer limit of the system's operational envelope.

b. Nontheater/nontactical information systems also follow the acquisition phases depicted in DODI 8120.2. All developmental testing of nontheater/nontactical information systems is conducted by the developer in conjunction with the user.

2-13. Software T&E

For more detailed information regarding software T&E, see DA Pam 73-7.

Section IV

Test and Evaluation of Nondevelopmental Items (NDI)

2-14. Concept

Nondevelopmental items provide a preferred alternative to a full R&D acquisition program. If the market surveillance reveals that items are available which have a high probability of meeting the user's requirements cost effectively across the life cycle, this potential should be investigated.

a. NDI feasibility may surface before preparation of the Mission Need Statement (MNS) or may be identified during the market investigation. This determination is based upon continuous market surveillance, front-end analysis, responses to Mission Area Analysis deficiencies, and the proposed solution in the materiel acquisition decision process. The market investigation becomes much more important as a data source for NDI systems and often is the only source prior to the MS I/III decision review.

b. T&E requirements to support an NDI acquisition approach do not differ appreciably from the T&E requirements for a developmental program: a TIWG must still be formed, a TEMP is required, test data must be available, and a developmental evaluation/assessment must be performed by the developmental independent evaluator/assessor.

2-15. NDI acquisition

Prior to the MS I decision, both the developmental and operational evaluators prepare evaluation plans which are used to guide the market investigation. These contain system-specific questions (for example, performance, MANPRINT, operation, support concept, and design features) that must be answered during the market investigation process. The answers to these questions will generally require the evaluation/assessment of existing commercially available test data, technical feasibility test results, or user experimental data.

2-16. NDI Test and Evaluation Master Plan

If the results of the market investigation indicate that a NDI solution is feasible, the TEMP will reflect the test activities, if any, required to do one of the following:

a. Proceed directly to a combined MS I/III decision review which makes the production and type classification decisions; or

b. Proceed to a MS I/II decision review. In this instance, the requirement for a PQT of the NDI candidates will be evaluated. If necessary, this test should be conducted post MS I/II and pre-MS III to determine if requirements are fully satisfied. The extent of modifications, if required, is one factor which determines if and how much testing is necessary.

2-17. Developmental Test and Evaluation for NDI

Developmental testing requirements should be tailored to each specific system. DT&E should be conducted at a minimum to verify integration and interoperability with other system elements. Additional T&E, as appropriate, should be conducted to evaluate and control risk. The following provides general guidance, not rigid requirements, of the testing activities appropriate for the following NDI options:

a. NDI to be used in the same environment for which they were designed (that is, no development or modification of hardware or software is required) will normally not require developmental testing before the MS I/III decision; however, available data should be sufficient to assess safety, RAM, performance, producibility, supportability, and transportability. TFT may be conducted to support the MS decision. When the production contract is awarded to a contractor who has not previously produced an acceptable finished product and the item is assessed as high risk, a PVT may be required before materiel release.

b. Those off-the-shelf items which require some modification of hardware or operational software (for example, militarization or ruggedization) may require TFT unless the decision authority documents that further testing is not required. PQT is required if feasibility testing results in the necessity for fixes to the item. PVT is required to support materiel release.

c. A research and development effort is required for integration of NDI subsystems, modules, or components which contribute to a materiel solution. Systems engineering, software modification, and testing are required to ensure the total system meets user requirements and is producible as a system. TFT is required in a military environment. A system-level PQT, hardware and computer software integration tests, and a PVT are required. PQT and PVT should be similarly designed. If the PQT is completely successful, the PVT may take the form of a first article test. If the PQT identifies required fixes, the PVT will address only those parameters that are still in question.

d. Significant consideration should be given to logistics support when acquiring NDI. Maximum use will be made of existing commercial support and existing data should be used whenever possible. A logistics demonstration or supportability test should be considered when the envisioned military support concept differs from the existing commercial support concept, and no data exists to confirm adequacy of the proposed concept.

e. Some follow-on testing of the NDI may be required to verify the adequacy of corrective actions indicated by the PVT.

f. Significant consideration should be given to radio frequency spectrum supportability when acquiring NDI for world-wide deployment and fielding. Commercially available NDI spectrum dependent equipment may not be frequency supportable in certain international regions and every sovereign nation. Host nation spectrum approval is required prior to fielding and operations.

Section V

Live Fire Test and Evaluation (LFT&E)

2-18. Requirement for LFT&E

Through a series of amendments to Title 10, United States Code, Congress has mandated that all covered systems and major munition missile programs undergo a realistic live fire test and Evaluation program prior to the decision to proceed beyond low-rate initial production.

2-19. Objective of LFT&E

The objective of LFT&E is to support a timely and thorough evaluation of the system's vulnerability and lethality. The scope of LFT&E should build upon early developmental tests of components, and system vulnerability and lethality modeling.

2-20. LFT&E strategy

The LFT&E strategy is prepared and approved as early as possible in the acquisition cycle and is the foundation for the LFT&E section (part III) of the TEMP. For OSD oversight systems, it is required that a planning matrix detailing LFT&E strategies, schedules, issues, and test plans be part of the TEMP. See DA Pam 73-6 for detailed information regarding LFT&E.

Section VI Developmental Test and Evaluation for Clothing and Individual Equipment

2-21. Acquisition philosophy

The acquisition of clothing and individual equipment (CIE) is governed by AR 700-86. The overall philosophy is very similar to the process described in AR 70-1, except that an Army Clothing and Equipment Board and a Clothing Advisory Group recommends items for approval by the Vice Chief of Staff, Army.

2-22. Requirements for DT&E

Testing requirements are outlined in part III of a Statement of Need of the CIE. Upon procurement of a CIE item, government initial production testing should be conducted to certify the specifications so that future procurements and the Defense Logistics Agency's quality control are effective. T&E management documents for the acquisition of CIE are the same as those required for the acquisition of ACATs III and IV systems acquired under the auspices of AR 70-1, that is, TEMP, IAP, detailed test plan (DTP), test report, and independent assessment report (IAR).

Section VII Developmental Test and Evaluation in Support of Type Classification

2-23. Purpose of type classification

Type classification is the process which identifies the degree of acceptability of a materiel item for Army use and provides a guide to authorization, procurement, logistical support, and asset and readiness reporting. See DA Pam 70-3, for type classification designations and applicability.

2-24. Developmental test and evaluation requirements

Type classification is an integral part of the MS III decision process. Testing and program documentation requirements are the same for the production decision and the type classification designation. As a minimum, PQT should be completed before the full-rate production decision.

Section VIII Joint Acquisition Program Developmental Test and Evaluation

2-25. Defined

A joint acquisition program is any Defense acquisition system, subsystem, component, or technology program that involves formal management or funding by more than one DOD component during any phase of a system's life cycle. Participants in joint acquisition programs coordinate all resources early in the joint T&E process.

2-26. DT&E for Joint Acquisition Programs

DT&E for acquisition programs being developed and tested jointly follow the testing procedures of the designated lead service. All program documents, including the TEMP as well as other T&E

plans and reports, are developed by the lead service (see AR 73-1, chap 3).

Section IX System Changes

2-27. Types of system changes

System changes may be major modifications, modifications, upgrades, or information system changes.

a. Major modifications, in and of themselves, meet the criteria of Acquisition Categories (ACATs) I or II or are so designated by the decision authority, and usually require a MS IV decision. In this case, the milestone decision authority determines which acquisition phase should be entered and T&E will be conducted in accordance with this decision.

b. Modifications are changes to a system still being produced.

c. An upgrade is a change to a system that is out of production.

d. Information system changes are changes to the software of deployed materiel systems (that is, theater/ tactical information systems), and will be discussed in this pamphlet as modifications.

e. Modifications and upgrades, whether a result of preplanned product improvements, engineering change proposals (ECPs), or PDSS, may require developmental test and evaluation/assessment. The purpose of testing system changes is to determine the viability and adequacy of the change and to determine if the change was achieved without degradation to the system, other components, and interface equipment. Therefore, the required scope and type of T&E varies for each system change.

2-28. DT&E requirements

To determine the required T&E, the materiel developer, in coordination with the combat developer and the independent evaluators/assessors, determines which procedure will be employed for the conduct of T&E. The procedures are:

a. The TIWG process with all T&E documented in the TEMP. This is the same procedure used for a new development program and a major modification, and includes an independent developmental evaluation/assessment as well as an operational evaluation.

b. An abbreviated T&E procedure that does not require a TEMP or an operational evaluation/endorsement. This procedure may or may not require developmental testing and evaluation. This is determined by the materiel developer in coordination with the TIWG. The materiel developer consults the coordination checklist (see DA Pam 73-1, fig 6-1) to determine if coordination with the developmental evaluator/assessor is required. If coordination is required, a modification package is provided to the evaluator/assessor for determination of the need to conduct a formal evaluation/assessment and/or requirement to conduct developmental testing. The developmental evaluation/assessment may not be required if the checklist indicates the coordination is not required or if the developmental evaluator/assessor (after review of the modification data) decides the evaluation/assessment is not needed. In the latter case, formal notification to the materiel developer will be made by the evaluator/assessor. In both cases, the materiel developer will furnish the independent evaluator/assessor a copy of the completed checklist for information.

Chapter 3 Requirements Translation

3-1. Requirements review

The proper interpretation of user requirements and the subsequent translation of those requirements into performance issues and then to testing issues/parameters is the first step of a test program. The Mission Needs Statement (MNS) and the Operational Requirement Document (ORD) serve as the basis for the translation of broad operational capability needs and requirement into system-specific performance requirements.

a. The Mission Need Statement (MNS) initiates the MS 0 review.

It is a statement of the need for an operational capability that is nonsystem specific and states the requirements in broad operational terms. The MNS forms the basis for the Operational Requirements Document.

b. The ORD contains objectives and minimum acceptable requirements for performance tailored to each concept. These requirements are generated by the combat developer and coordinated with the materiel developer and the TIWG members.

3-2. Development of contractual documents

The materiel developer generates the contractual documents. The translation of requirements to specifications and then to testing criteria is one of the most difficult transitions in the materiel acquisition process. Because these contractual documents must be legally exacting and enforceable as well as technically complete, they are usually more voluminous and quite different from the corresponding requirements document. The testers and evaluators must be involved in the development of these documents (that is, the Request for Proposal (RFP) and related contractual documents such as the system and development specifications) throughout the review process. The TIWG must review them to ensure the proper criteria are reflected and the requirements are testable.

3-3. Role of the developmental tester and evaluator/assessor

The transition from requirements document to contractual requirements is an important element in the development of a successful test and evaluation program. A major function of the TIWG members is the review of contractual documents for T&E adequacy. In particular, the developmental tester and evaluator/assessor must know the system requirements that are contained in both the ORD and the contract in order to formulate a testing strategy that takes into consideration the technical requirements and the issues to be answered prior to acceptance by the government. This review provides the TIWG the opportunity to ensure maximum advantage of testing resources. It also facilitates the test data confirmation procedures outlined in paragraph 6-13 of this pamphlet.

3-4. Confirmation of the translation process

When the contractor receives the contractual document containing these requirements, there is another translation process. This is the actual fabrication of an end product intended to meet not only the technically exacting specifications of the contract, but also the program baseline requirements. Government developmental testing provides the materiel developer, the developmental evaluator/assessor, and the decision maker with information on the contractor's success at meeting the performance standards and establishes the safety parameters for operational testing. In a technical sense, it is a feedback loop that measures what was produced by the contractor against what was intended by the contract. This process is important because it allows the materiel developer to iterate and refine the product when problems are revealed. It also confirms that the product being produced is acceptable.

3-5. Critical system characteristics

The ORD identifies the critical system characteristics with proposed thresholds and objectives. Critical system characteristics are those design features that determine how well the proposed concept will function in its intended operational environment. They include survivability; lethality; transportability; electronic counter-countermeasures; energy efficiency; and interoperability, standardization, and compatibility. Selected critical system characteristics are included in the TEMP as critical technical parameters.

3-6. Critical technical parameters

Critical technical parameters (CTP) are developed jointly by the developmental independent evaluator/assessor, the materiel developer, and the combat developer, with input from other TIWG members as required. The CTPs are listed in matrix format with accompanying objectives and thresholds in part I of the TEMP (DOD 5000.2-R, appendix III).

a. Each CTP has measurable objectives and thresholds to be evaluated. They are derived from the ORD, the critical system characteristics (including software maturity and performance measures), and the technical performance measures. CTPs establish a relationship between the operational requirements and the developmental test and evaluation to be performed during each acquisition phase. CTPs are evaluated using data obtained through testing, surveys, studies, modeling and simulation or other analytical means.

b. Part III of the TEMP includes the specific critical technical parameters which the milestone decision authority has designated as exit criteria and which must be confirmed in each phase of testing. To ensure a smooth transition of the system from DT&E to the initial operational test and evaluation (IOT&E), the CTPs should be linked to the critical operational issues and criteria (see DA Pam 73-3).

c. The following areas are critical and should be considered when applicable: system performance; physical attributes; reliability, availability, and maintainability; system safety; transportability; health hazards; natural environmental or climatic effects; logistic supportability; software; compatibility and interoperability; survivability, including conventional ballistic vulnerability; nuclear hardness and survivability; electromagnetic environmental effects; directed energy vulnerability; chemical, biological, radiological vulnerability; electronic warfare, countermeasures and counter-countermeasures; training; and vulnerability and lethality.

3-7. Noncritical technical parameters

Noncritical technical parameters may be required by the developmental evaluator/assessor for completeness or by regulatory guidance. Noncritical parameters may become critical as the system evolves. Noncritical technical parameters are documented in the IEP/IAPs.

Chapter 4 Developmental Test and Evaluation

Section I Role of the Developmental Tester

4-1. Mission of the developmental tester

a. The developmental tester plans, conducts, and reports the results of developmental tests. DT reports are provided to the materiel developer, the independent developmental evaluator/assessor, the milestone decision review body, and, for ACAT I and other OSD T&E oversight programs, to OSD through the Deputy Under Secretary of the Army (Operations Research) (DUSA(OR)).

b. All government developmental testing and associated production testing on Army materiel systems are executed by the U.S. Army Test and Evaluation Command (TECOM) unless otherwise designated in the TEMP. Developmental testing of Army information systems is conducted at U.S. Army Information Systems Command (ISC) facilities or at TECOM facilities, and the responsible agency for developmental testing of strategic missile defense systems is the U.S. Army Space and Strategic Defense Command (SSDC). All other exceptions are documented in Chapter 2, AR 73-1.

4-2. Contract requirements for testing

Procurement policies define testing as that element of inspection which determines the properties or elements, including functional operation of supplies or their components, by the application of established principles and procedures. Inspection is defined as "examining and testing supplies or services (including, when appropriate, raw materials, components, and intermediate assemblies) to determine whether they conform to contract requirements."

4-3. Review of requirements

The contracting officer or his/her representative has responsibility for all contractual matters. However, the materiel developer should

rely on the developmental tester for assistance in ascertaining that the technical aspects of the system, as described in the contractual document, are properly tested. For this reason, the materiel developer requests the government developmental tester review the requirements and testing portions of both the solicitation and the contractual documents. Since the contract designates when and in what manner the Government reserves the right to determine that the technical requirements in the contract are met, the government developmental tester provides input to the materiel developer prior to issuance of the solicitation document. This review centers on the requirements relating to the quality of the product and those quality controls incumbent on the contractor to ensure that the product conforms to contractual requirements.

4-4. Quality requirements

The complexity of Army acquisitions and their critical application (in which failure could injure personnel or jeopardize a vital mission) requires that the statements in the contractual documents related to quality requirements be tested by the government developmental tester. Under some circumstances, this testing may be done by the contractor; however, this decision is part of the TIWG process and will be documented with rationale in TEMP.

4-5. Source Selection Evaluation Board

The Government's developmental tester should be an advisor to and may, if appropriate, participate in Source Selection Evaluation Board (SSEB) deliberations. In this way, testing programs can be planned and structured to optimize the acquisition approach.

4-6. Cost estimates for private industry

a. Under contract with a DOD agency. When a contract between a private industry and DOD agency already exists, Army test agencies are authorized to charge DOD rates for testing services. Under these circumstances, approval from the DOD agency under contract with the private industry is required. The contracting government agency should provide to the Army test agency, in writing, confirmation that a contract exists and request DOD rates be charged. The request for test and cost estimate as well as payment of test funds may come from private industry. If the funds are received at the test agency directly from the private industry, a contract must be signed by both parties and in place prior to testing. A prospective contractor who is preparing to bid on a government contract which includes a requirement for testing may request and receive a cost estimate for the test from the test agency.

b. Private industry testing. Test services may be provided by Army facilities for private industry when no related acquisition contract exists. The FY94 Defense Authorization Act amended Title 10 of the U.S. Code to provide increased access to DOD T&E facilities by commercial users. DOD guidance requires MRTFB facilities to charge commercial customers all direct costs associated with the test, but permits the MRTFB commanders to determine the indirect costs to be charged as deemed appropriate.

Section II Role of the Independent Developmental Evaluator/ Assessor

4-7. Continuous evaluation

a. A continuous evaluation process is used on all acquisition programs (see DA Pam 73-1). It emphasizes the role of the independent evaluation/assessment throughout the acquisition process and ensures a responsible, timely, and effective evaluation/assessment on the status of a system as it progresses into mature system effectiveness and suitability. Early involvement of the evaluators/assessors in the acquisition process is vital to a successful developmental program, ensuring DT and OT are complementary, all available data are used, and resources are used effectively and efficiently.

b. The evaluators/assessors contribute to the acquisition and fielding of an effective, supportable, and safe system by assisting in the engineering design and development, and verifying attainment of

technical performance specifications, objectives, producibility, adequacy of the Test Design Plan (TDP), supportability, RAM and MANPRINT aspects. Developmental evaluation encompasses data obtained from the use of models, simulations, and test beds, as well as that obtained from prototypes or full-scale development models of the system.

4-8. Developmental evaluation/assessment responsibilities

All acquisition categories are either independently evaluated or independently assessed (see AR 73-1, para 4-8). At program initiation (MS I), a decision is made as to whether the program will be evaluated or assessed based on the following criteria:

a. AMSAA will perform independent developmental evaluations of ACAT I, ACAT II, and OSD T&E oversight programs and their associated product improvements, TMDE, ammunition, system specific support items, and training devices.

b. TECOM will perform independent developmental assessments of other systems (ACATs III and IV) and associated product improvements, TMDE, ammunition, system specific support items, and training devices.

c. Once assigned to either the Army Materiel Systems Analysis Activity (AMSAA) or TECOM, the responsibility for evaluation or assessment remains with that organization throughout the life cycle, unless reassigned by Headquarters (HQ), U.S. Army Materiel Command (AMC) or HQ, Department of Army (DA).

d. For ACATs III and IV programs, when the technology or mission of the system is so similar to that of an ACAT I, ACAT II, or OSD T&E oversight system as to warrant evaluation, it may be determined that the system will be evaluated by AMSAA.

e. For those ACATs III and IV systems in which the level of technology or the requirements for modeling and simulation indicate that an evaluation would be appropriate, the decision may be made that an evaluation will be performed by AMSAA.

f. The SSDC has responsibility for the independent developmental evaluation of special SSDC programs, and the ISC is responsible for the developmental evaluation of assigned information systems.

g. The U.S. Army Research Laboratory, Survivability/Lethality Analysis Directorate (SLAD) has the mission to conduct the survivability/lethality/vulnerability (SLV) analysis of U.S. Army systems in development. SLAD conducts threat studies, theoretical studies, modeling and simulations, equipment development, and laboratory and field experiments in support of their mission. This analysis is incorporated into the IER/IAR (AR 70-75).

4-9. Basis for evaluation/assessment

The independent developmental evaluation/assessment is based on test data, reports, studies, and other appropriate sources, and is the culmination of a major effort by many people. The evaluation/assessment compares the performance of the item, as derived from the test data, directly with the requirements reflected in the ORD and the critical technical parameters contained in the TEMP. The independent evaluator/assessor also compares the test results to the required operational performance according to the mission profile, to the cost and operational effectiveness analysis (COEA), and to any past results, and addresses questions concerning the validity of the requirements.

4-10. Procedures/techniques for evaluation/assessment

The independent developmental evaluator/assessor prepares the IEP/IAP that addresses all aspects of the developmental evaluation relative to the system. The IEP/IAP details the independent developmental evaluator's/assessor's planned actions for the developmental evaluation. The IEP/IAP are updated as needed to reflect materiel and program changes. Through the IEP/IAP, the evaluators/assessors identify the procedures and techniques which will be used in the evaluation. For example:

a. Specific models will be identified (reliability growth, performance, logistics, and so forth).

b. Methods of statistical analysis (inferential techniques) are identified, such as hypothesis testing and analysis of variance.

c. Comparison of results to the requirements may be accomplished through quantitative comparison or subjective/qualitative comparison.

d. Measures of effectiveness are developed (system effectiveness, fractional target damage, probability of a kill given a hit, probability of a hit, probability of detection, etc.).

4-11. Reporting evaluations/assessments

For each milestone decision review and the materiel release decision, the developmental evaluator/assessor prepares an IER/IAR. Coordination of information contained in the IER/IAR between the testers and evaluators is important to ensure that test data are accurately reflected. The IER/IAR highlights those technical parameters that have been evaluated and require no additional analysis. They also present those that need further evaluation to support MS decisions, as well as materiel release actions.

4-12. Mission of evaluators/assessors

a. The independent developmental evaluator/assessor serves on the following working groups, committees, or teams, if formed: Special Task Force, Special Study Groups (AR 71-9), Integrated Product Teams (IPTs), TIWGs, Test Readiness Reviews, RAM scoring conferences and assessment conferences, MANPRINT Joint Working Groups, System Safety Working Groups, market survey teams, and ILS Management Teams. The independent developmental evaluators/assessors normally brief the IER/IAR at pre-Army Systems Acquisition Review Councils (ASARC) and In-Process Reviews (IPR) for materiel systems and at pre-Major Automated Information Systems Review Councils (MAISRC) for information systems. Developmental IER/IARs, as well as the operational T&E Report (TER) and the Operational Assessment (OA), are briefed by the operational evaluator at the ASARC and the MAISRC.

b. Specific actions to be performed by the developmental evaluator/assessor are—

(1) Review and be knowledgeable of applicable Mission Area Analysis results.

(2) Review requirements documents, critical issues, and the System Threat Assessment Report (STAR).

(3) Provide information to, and draw information from, the TIR data base (see DA Pam 73-1).

(4) Review system support packages.

(5) Develop technical parameters and process for approval as appropriate.

(6) Participate in the development of system acquisition strategies, and assist in the development of test portions of selected Requests for Proposal (RFP).

(7) Within the TIWG, develop procedures to accept data gathered from all sources.

(8) Perform developmental test integration as a member of the TIWG, assist in the development of, and provide concurrence in, the TEMP, and chair the LFT&E Working Group, if required.

(9) Review and comment on test plans.

(10) Respond to questions and provide input in terms of performance analysis during the development of the COEA, cost and training effectiveness analysis (CTEA), and other cost analyses.

(11) Review and comment on the System MANPRINT Management Plan and the ILS Plan.

(12) Develop IEP/IAPs, Test Design Plans (TDPs), and IER/IARs.

(13) Review and provide concurrence in the Reliability and Maintainability Requirements Rationale.

(14) Determine and coordinate modeling and simulation needs and use their results.

(15) Monitor tests in coordination with the developmental tester.

(16) Recommend approval/disapproval of requests for waiver of approved tests and recommend test suspensions when required.

(17) Evaluate Test Incident Reports (TIRs) and corresponding corrective actions.

(18) Advise in source selection activities, as required by the materiel developer.

(19) Present results of developmental IER/IARs at Operational Test Readiness Reviews (OTRR), as appropriate.

c. The developmental evaluators/assessors continue involvement throughout the system life cycle by monitoring key deployment activities. This is accomplished by participation in system performance reviews; fielded equipment reviews (for example, Fielded System Review); research, development, and acquisition reviews; and sample data collection. Involvement is also accomplished by monitoring stockpile reliability and lot acceptance tests.

Section III

Role of the System Contractor, Logistician, Combat Developer, Materiel Developer, and Functional Proponent in Support of Developmental Testing

4-13. System contractor

The objectives of developmental testing and evaluation include verifying system maturity, logistic supportability, human factors, and system safety. One of the primary objectives is to verify reliability, availability, maintainability-durability (RAM-D) maturity. Therefore, testing is designed to find, analyze, and fix problems and verify the solutions. Meeting these objectives requires engineering level involvement of and discussions with system contractor personnel.

a. The degree and nature of system contractor involvement in developmental testing must be agreed upon by the materiel developer, the independent evaluators/assessors, the government tester, and all others concerned. These agreements are reached through the TIWG process and are then communicated through the contractual requirements. Developing these agreements early will help to ensure that test data will be usable for evaluation.

b. Contractor involvement may range from no direct involvement, to providing spare parts and technical advice during the conduct of the test, to performing entire tests. When the contractor will be directly involved in the conduct of testing at a government facility, special consideration may be required to address security, personnel safety, and the protection of competition sensitive test data. When the contractor will perform the testing, consideration should be given to the use of a combined government/contractor developmental test team. Use of the team provides for government participation in the development of the contractor test plans. The test results are reported by the contractor and verified by the government test personnel, thus avoiding duplication of testing.

c. The degree of system contractor involvement in scoring/assessment conferences (see app C) dealing exclusively with developmental test and evaluation will, likewise, be determined by the materiel developer in coordination with the TIWG. Contractor personnel, in general, should not be physically present during the formal voting/scoring/assessment period. However, the presence of contractor personnel may be allowed during formal scoring at developmental scoring conferences if it is considered necessary for proper information flow. At anytime in this process, a contractor may be asked to appear to answer questions, but should leave after the questions have been answered. Exceptions to this guidance are discussed in the following paragraph.

d. In those cases where DT and OT are planned and described in the TEMP to be combined or integrated under similar conditions (for example, operational mode summary/mission profile, stresses, environmental conditions, test support, fixed and same configuration, and so forth.), DT results may be combined with IOT results. The parameters for contractor involvement should be carefully coordinated initially at the TIWG and throughout the T&E process to ensure the materiel developer's contractual obligations and the independent operational evaluator's statutory restrictions are met. (Reference DA Pam 73-1.)

4-14. Army logistician

The logistician works closely with the acquisition community through the Integrated Product Team (IPT), Integrated Logistics Support Management Team (ILSMT), TIWG, and other program reviews to provide for a continuous assessment of logistics support

program management and execution for all assigned acquisition programs. The logistician contributes to the identification and resolution of logistics issues while reviewing and assisting with the development of program management documentation. The logistician assists the acquisition community with selected analyses using approved models to support repair or discard decisions, level of repair decisions, selection of secondary items to be stocked, and other cost benefit analyses. AMSAA represents DA (Deputy Chief of Staff for Logistics (DCSLOG)) as the logistician for most new, modified, and displaced systems. For Class VIII medical materiel, the Army logistician is the U.S. Army Medical Materiel Agency (USAMMA). For most nontactical information management systems, the logistician is ISC.

4-15. Reporting logistical evaluations/assessments

AMSAA, as the logistician, maintains a continuous assessment of assigned acquisition programs in an automated data base, the ILS Management Information System (ILSMIS). The assessments include the program description, milestones, ratings for the 17 ILS assessment considerations (AR 700-127), and assessment issues and associated actions based on the tailored assessment issues and criteria delineated in DA Pam 700-28. Limited direct access is available to the acquisition community and assessment reports are available upon request. Periodic assessment reports published include the following:

a. Each month, an assessment of each designated Monthly Acquisition Program Review (MAPR) system is provided to DCSLOG in support of the MAPR. For programs where AMSAA is the developmental evaluator, the logistics assessment is also incorporated into the monthly assessment provided to DA (Assistant Secretary of the Army (Research, Development, and Acquisition) (ASARDA)) in support of the MAPR.

b. The logistician's position for each milestone decision review is supported by an assessment of the program. The assessments are maintained in the ILSMIS. As a general rule a written assessment is not published unless requested for programs for which AMSAA represents the DA DCSLOG at the review, but the automated assessment from the ILSMIS is available upon request. For programs where AMSAA is the independent developmental evaluator, the logistics assessment is incorporated into the IER.

c. Formal written assessments are provided to DA DCSLOG in support of formal DA ILS reviews, ASARC reviews, and Defense Acquisition Board (DAB) reviews.

d. Twice each year, for all ACATs I/II and other programs where there have been active ILS issues, assessments are printed from the ILSMIS and distributed to the acquisition community in a report known as the Worldbook.

4-16. Combat developer

The combat developer, functional proponent, or training developer, based on the needs of the user, develops system requirements, Critical Operational Issues and Criteria (COIC), and test support packages (doctrinal, organization, and training) for proponent systems. Test support packages are provided to Army testers to support DT and OT of materiel and information systems (See DA Pam 73-1, Chapter 9). The U.S. Army Training and Doctrine Command (TRADOC) is the Army's principal combat and training developer and trainer for materiel systems and theater and tactical information systems.

4-17. Materiel developer

The Army's materiel developer is the research, development, and acquisition command, agency, or office assigned responsibility for the system under development or being acquired. The materiel developer provides matrix support to the program manager by supporting the planning and formulation of budgets associated with the developmental T&E functions. Support provided by the materiel developer also includes centralized T&E management through the T&E Manager at the major subordinate command, including the

development of, or providing input to, a variety of support documents (see app D).

4-18. Functional proponent

The functional proponent, a command, Army staff element, or agency, establishes and documents system requirements, COIC, and test support packages for information systems, and formulates the concepts explaining the intended use of the system.

Section IV Developmental Test Types

4-19. Categorization

Developmental tests are categorized as reflected in AR 73-1, chapter 4. A definition and brief description of the developmental tests performed throughout the acquisition cycle follow. The test types are separated into the pre-MS III, production, and post-production phases. The software tests defined here are software qualification tests (SQT) and PDSS. For other developmental tests conducted by the developer of the software, see DA Pam 73-7.

4-20. Pre-MS III developmental test types

Pre-MS III developmental testing ranges from program initiation to the MS III production decision and includes funding categories 6.1 through 6.4.

a. *Research efforts/tests.* These are developmental efforts/tests conducted prior to MS 0 to determine early technical parameters, to support the research of these items, and to provide fundamental knowledge for solutions of identified military problems. Program funding categories - 6.1 and 6.2.

b. *Technical feasibility test (TFT).* The TFT is conducted post-MS 0, pre-MS I, or MS I/II to assist in determining safety, establishing system performance specifications, and determining feasibility of alternative concepts. Testing during the Concept Exploration and Definition phase identifies and reduces risks in subsequent acquisition phases. This test provides data for the independent developmental evaluation/assessment which supports the MS I or MS I/II decision. Program funding category - 6.3.

Note. While not tied to specific acquisition programs, the following Technology Base demonstrations may be conducted by the Government developmental tester. Technology demonstrations are conducted to assess the military utility or cost reduction potential of innovative Government or commercially developed technology.

(1) Advanced technology demonstrations (ATDs) are used to expedite technology transition from the laboratory to operational use. They are demonstrations conducted in an operational environment and are primarily funded with 6.3 funds. These demonstrations may integrate advanced technologies to establish the feasibility of a concept or may utilize prototypes, surrogates, and simulations to show that existing technology can support a concept. ATDs should include provisions for early testability and operational assessments.

(2) Proof of Principle (POP) demonstrates, in a nonoperational environment, innovative technologies that will support system upgrades or provide new operational capabilities. POPs are technical demonstrations and troop experiments conducted with brassboard configurations, subsystems, or surrogate systems.

c. *Engineering development test (EDT).* DT conducted post-MS I, pre-MS II to provide data on performance and safety, and to demonstrate attainability of critical technologies and processes, and to define design characteristics and capabilities including ruggedness of hardware configurations and determination of technical risks. The EDT includes the testing of compatibility and interoperability with existing or planned systems, and the effects of natural and induced environmental conditions. This test provides data for the independent developmental evaluation/assessment which supports the MS II decision. Program funding category - 6.3.

d. *Production proveout test (PPT).* The PPT is a DT conducted with prototype hardware post-MS II or post-MS I/II, prior to MS III, and provides data for the selection of the most appropriate source or design. When MS I and MS II are combined, PPT may also be used

to provide data on safety, the achievability of critical system technical parameters, refinement and ruggedization of hardware and software configurations, and determination of technical risks. Program funding categories - 6.4 and 6.5.

e. *Production qualification test (PQT)*. The PQT is a system level DT conducted post-MS II or post-MS I/II (usually just prior to MS III) that demonstrates design integrity over the specified operational and environmental range. These tests usually use prototype or preproduction hardware and software fabricated to the proposed production design specifications and drawings. Such tests include contractual reliability and maintainability demonstration tests required prior to production release. This test provides data for the independent developmental evaluation/assessment which supports the MS III production decision. Program funding category - 6.4.

(1) The objectives of the PQT are to obtain Government confirmation that the design is stable, logistically supportable, capable of being produced efficiently, and will meet the performance/user requirements; assess the performance envelope; and determine the adequacy of any corrective action indicated by previous tests.

(2) PQT may also include tests which are not included in the data package or contract (for example, environmental extremes, test-to-failure, and so forth) when such tests are necessary to obtain engineering data to verify corrective action or other purposes. PQT may be accomplished in phases (for example, preliminary engineering, specific problem correction, and so forth).

f. *Live Fire tests (LFT)*. For those weapons systems required by law to undergo Live Fire test and evaluation (see DA Pam 73-6), the LFT is conducted as part of or in conjunction with the PQT. The LFT demonstrates the ability of the system to provide battle resilient survivability, or the munition to provide lethality. It will provide insights into the principal damage mechanisms and failure modes occurring as a result of the munition/target interaction and into techniques for reducing personnel casualties or enhancing system survivability/lethality. The scope of LFT&E should build on early developmental tests of components and system vulnerability and lethality modeling. LFT is conducted with 6.4 or procurement funding.

g. *Logistic demonstration (LD)*. An LD is a system-level test to provide data for the evaluation of the supportability of the materiel design and the system support package. It includes a nondestructive disassembly and reassembly of equipment, conducted on a dedicated engineering prototype or limited production item prior to MS III. The LD evaluates the achievement of maintainability goals; the adequacy and sustainability of tools, built-in-test equipment, selected test program sets, technical publications, maintenance instructions, trouble-shooting procedures, and personnel skill requirements; the selection and allocation of spares and repair parts, tools, test equipment, and tasks to appropriate maintenance levels; and the adequacy of maintenance time standards. The LD is ideally conducted at least six months prior to the initial operational test (IOT) to allow time to make corrections, if required. It is often convenient to conduct an LD in conjunction with the PQT. The LD may use selected analysis, evaluations, demonstrations, and testing tailored to each acquisition program to demonstrate adequacy of the proposed support concept and programmed support resources. Program funding category - 6.4.

h. *Software qualification test (SQT)*. The SQT is a system-level test conducted by the Army developmental tester using live data files supplemented with user prepared data and executed on target hardware. Conversion procedures and special training requirements are introduced as additional elements for verification and validation. The objectives of the SQT are to have the Government confirm that the design will meet the performance/user requirements and to determine the adequacy and timeliness of any corrective actions indicated by previous testing. System users participate in the technical and functional aspects of the SQT.

i. *Command, Control, Communications, and Intelligence (C3I) interoperability certification test*. The interoperability certification test is a test which applies to C3I systems having interfaces or

interoperability requirements with other systems. This test may consist of simple demonstrations using message analysis or parsing software with limited interface connectivity, or extend to full-scale scenario-driven exercises with all interfaces connected. The U.S. Army Communications-Electronics Command (CECOM) serves as the Army Participating Test Unit (APTU), and in that capacity, supports interoperability testing of C3I systems conducted by the Defense Information Systems Agency (DISA) for system certification and recertification. The CECOM APTU arranges and coordinates all Army interoperability testing with the DISA and coordinates the participation of all Army elements and systems. (See Joint Interoperability and Engineering Organization/Joint Interoperability Test Command (JIEO/JITC) Circular 9002, Requirements Assessment and Interoperability Certification of C4I and Automated Information Systems (AIS) Equipment and Systems.)

4-21. Production testing

Production testing is required to verify that the requirements specified in the TDP and production contracts for hardware and software are met. It also provides test data for the independent developmental evaluation/assessment required for materiel release action, ensures the product continues to meet the prescribed requirements, and provides a baseline for post-production testing. Program funding category - procurement.

a. *Production verification test (PVT)*. PVTs are system-level tests conducted post-MS III to verify that the production item meets critical technical parameters and contract specifications, to determine the adequacy and timeliness of any corrective action indicated by previous tests, and to validate the manufacturer's facilities, procedures, and processes. A PVT will also provide a baseline for the test requirements in the technical data package for post-production testing. The PVT is accomplished during the first limited production or full-scale production contract. This test provides data for materiel release, allowing the independent evaluator/assessor to address the adequacy of the system with respect to the stated requirements. Materiel release is accomplished during the first post-MS III production contract and is repeated if the process or design is significantly changed, if a second source for the system or major components therein is brought on line, or if a significant break in production occurs (AR 700-142).

(1) The PVT may take the form of a first-article test (FAT) if such testing is required in the technical data package for quality-assurance purposes. This may be required to qualify a new manufacturer or procurements from a previous source out of production for an extended period of time, and to produce assemblies, components, or repair parts which conform to the requirements of the technical data package. Requirements for FATs may be invoked in production contracts by citation of the applicable Federal Acquisition Regulation First Article Inspection and Approval clause. When a FAT is specified in a contract, it may not be waived or changed without prior approval of the head of the contracting activity. First article tests may be conducted at government facilities or at contractor facilities when observed by the Government. Requirements for the FAT should be consistent with those of the PVT.

(2) The PVT may also include tests that are not included in the data package or contract (for example, environmental extremes and test-to-failure) when necessary to obtain engineering data for corrective action verification, to support a materiel release decision, or to meet another purpose.

b. *Follow-on PVT*. A follow-on PVT may be conducted on full production models if the production process or design is significantly changed, or to verify the adequacy of corrective actions indicated by the PVT, or to determine production acceptability. Follow-on PVTs are structured similarly to PVTs.

c. *Comparison test (CPT)*. A CPT is a test of randomly chosen samples from production and is conducted as a quality assurance measure to detect any manufacturing or quality deficiencies that may have developed during volume production which could reduce effective operation of the item or result in item degradation. The CPT is conducted or supervised by an agent independent of the producer or by Government on-site quality assurance personnel, and

may be conducted at procuring agency facilities, Government testing installations, or contractor facilities.

d. *Quality conformance (acceptance) inspections.* These inspections are examinations and verification tests normally prescribed in the TDP for performance by the contractor and are subject to performance or witnessing by the on-site quality assurance representative on the items, lots of items, or services to be offered for acceptance under the contract or purchase order. These examinations and tests include, as necessary, in-process and final measurements or comparisons with technical quality characteristics required to verify that materiel meets all the terms of the contract and should be accepted by the Government.

e. *Tests in support of post-deployment software support (PDSS).* These are developmental tests that are conducted during PDSS for software intensive materiel systems. They parallel those described for pre-MS III, but are usually abbreviated based on the number, magnitude, and complexity of the modifications or maintenance. Tests in support of PDSS are conducted to assure that software modifications meet requirements, do not impair existing functions or performance, can be employed by users, and are effective and suitable.

f. *C3I interoperability certification test.* The interoperability certification test is conducted if major hardware and software modifications to the C3I system have been made that impact on previously established joint interface requirements. Recertification test schemes must be developed and must be commensurate with the level of changes involved in both the C3I system and the systems with which it must interoperate. The CECOM APTU arranges and coordinates all Army interoperability testing with the DISA and coordinates the participation of all Army elements and systems. (See Joint Interoperability and Engineering Organization/Joint Interoperability Test Command (JIEO/JITC) Circular 9002, Requirements Assessment and Interoperability Certification of C4I and AIS Equipment and Systems.)

4-22. Post-production developmental testing

Post-production DT is conducted to measure the ability of materiel in the field, in storage, and following maintenance actions (reworked, repaired, renovated, rebuilt, or overhauled) to meet user's requirements (for example, conforms to specified quality, reliability, safety, and operational performance standards). Program funding category - OMA.

a. *Surveillance tests.* Surveillance tests include destructive or nondestructive tests of materiel in the field or in storage at field, depot, or extreme environmental sites. They are conducted to determine suitability of fielded or stored materiel for use, evaluate the effects of environments, measure deterioration, identify failure modes, and establish/predict service and storage life. Surveillance test programs may be at the component-through-system level. System-level programs may include dedicated hardware allocated for this purpose, fielded materiel, or supplies in storage. Storage sites may include depots, field storage, or extreme environmental locations. "Libraries" of component parts to provide a baseline for subsequent surveillance test data comparisons may be established at contractor or government facilities. Criteria for surveillance testing will be prescribed in the appropriate technical bulletins, technical manuals, storage serviceability standards, and surveillance test plans.

b. *Reconditioning tests.* Criteria for reconditioning tests will be incorporated in depot maintenance work requirements, modification work orders, technical manuals, technical bulletins, and contracts. Reconditioning tests include the following categories:

(1) Pilot reconditioning tests are conducted to demonstrate the adequacy of the documented technical requirements, processes, facilities, equipment, and materials that will be used during volume reconditioning activities. The pilot model will be reconditioned in strict accordance with depot maintenance work requirements, modification work orders, technical manuals, technical bulletins, and

contracts. Pilot reconditioning testing relates to PVTs during production. Pilot reconditioning tests will be applied when depot maintenance work requirements (DMWR), technical manuals (TM), or technical bulletins (TB) are used the first time or when major changes are made.

(2) Initial reconditioning tests are conducted to demonstrate the quality of the materiel when reconditioned under volume (rate) procedures and practices. These tests relate to FATs during production. Initial reconditioning tests will be conducted when an item is reconditioned for the first time by a government or contractor facility, when changes in processes or facilities occur, or when there has been a significant break in reconditioning operations.

(3) Control tests are conducted on randomly selected items from volume reconditioning operations to verify that the process is still producing satisfactory materiel. Criteria should be the same as for initial reconditioning tests. These tests relate to CPTs during production.

(4) Acceptance tests are conducted on in-process materiel and when reconditioning activities are completed. An accept/reject decision is based on acceptance testing.

(5) Baseline evaluation tests (BETs) are conducted simultaneously on reconditioned and new production materiel of the same configuration to provide a comparison of performance and to determine the degree of reconditioning required. BET will be considered when the item is being reconditioned for the first time, when significant modifications affecting performance are incorporated, or to provide data on which to base a decision regarding upgrading versus new procurement.

c. *Test criteria.* Test criteria for post-production testing will be based on performance demonstrated during development and production. The number of items to be tested and the duration of tests will be based on sound engineering practices that consider schedules, costs, item complexity, known problem areas, statistical confidence, and other factors. Prior test data and analytically derived design data will be used when the test and sampling plan is developed. Existing test facilities will be used rather than building new government or contractor facilities.

Section V

Developmental Test Facilities and Services

4-23. Test facilities

The Army maintains and operates a group of test centers for the efficient accomplishment of developmental testing for research and throughout all phases of acquisition. These test centers have evolved as specialized and general purpose ranges and test facilities, with capabilities which cover the full range of Army systems. The capabilities of each of the Army developmental test facilities are described briefly in appendix B. The descriptions are not meant to be all-inclusive. Additional detail may be obtained directly from the test facility's parent command. For those test facilities that are part of the MRTFB, DOD 3200.11 provides a summary.

4-24. Requesting developmental test services

This paragraph provides procedures for requesting developmental test services from the U.S. Army Test & Evaluation Command. It includes procedures for requesting developmental testing and related support requirements as well as procedures for identifying future requirements involving TECOM facilities and resources.

a. *Program planning forecasts.*

(1) The program planning forecast is a mechanism designed to identify future developmental testing requirements. It serves a dual purpose: providing a forecast of requirements for developmental testing from the materiel developer to TECOM, and providing a preliminary budget estimate and test schedule from TECOM to the materiel developer. The planning forecast is not a firm commitment by either party for developmental testing, but is preliminary notification that developmental testing may be required at some point in the future.

(2) The forecast permits the Army to identify future requirements for developmental test resources and provides a quantitative basis

for test priorities and allocation of resources. It also supports requirements for facility development or upgrade, instrumentation development and acquisition, and test methodology studies, as well as justification for military construction plans.

(3) For program planning forecasting, future testing requirements are generally those scheduled to occur beyond the next 180 days and cover the current fiscal year, the budget fiscal year, and the POM years. If requirements can be forecasted beyond the POM years, it is beneficial. To initiate a program planning forecast, the materiel developer should provide the information reflected at figure 4-1.

(4) Developing/updating of the program planning forecast is essential and should be accomplished throughout the acquisition cycle. This can be done efficiently and effectively by an exchange of information throughout the T&E planning process. For example:

(a) As early in the acquisition cycle as possible, as T&E requirements are being considered during concept exploration and definition.

(b) During the preparation/review of the TEMP.

(c) As a result of negotiations at TIWG meetings.

(d) During program reviews, test coordination meetings, and so forth. Major updates will result in a revised budget estimate being provided to the materiel developer. (Insert figure 4-1 here).

b. Firm requests for testing requirements.

(1) Firm test requests should be submitted as early as possible to allow TECOM to plan, coordinate, and schedule resources and ensure that required safety, security, and environmental concerns have been properly addressed prior to the test. If the requirement was

previously identified via a program planning forecast, the transition to a firm request is accomplished smoothly and efficiently since most of the details have been previously provided.

(2) The firm test request should include the information reflected at figure 4-2.

(3) Additionally, the firm test request should include documentation required by regulation to be provided prior to conduct of developmental testing. This documentation includes a Safety Assessment Report, Security Classification Guide, and environmental documentation (for example, Record of Environmental Consideration, Environmental Impact Statement, Environmental Assessment). If these documents are not available at the time the test request is submitted, the request should reflect a date as to when the documentation will be provided.

(4) Any other documentation or information which would enhance TECOM's understanding of the test effort should be included.

c. Requests for testing.

(1) Both firm requests and program planning forecasts should be submitted to the Commander, TECOM, ATTN: AMSTE-TA-O, Aberdeen Proving Ground, MD 21005-5055. Requests may also be provided via e-mail (amstetao@apg-9.army.mil) or facsimile (DSN 298-9170) or commercial ((410) 278-9170).

(2) To request testing or additional information regarding the facilities at Kwajalein Missile Range, contact the KMR Program Development Office, P.O. Box 1500, Huntsville, AL 35807. The voice telephone number is DSN 645-3952, commercial (205) 955-3952; facsimile number is DSN 645-1880 or commercial (205) 955-1880.

Program planning forecasts should provide, as a minimum, that information highlighted by an asterisk (*). As test requirements evolve, subsequent updates will provide the additional information not available at the time of the initial forecast.

* **Test item nomenclature/description.** Description of item, to include model number and short title, and those existing or planned systems with which the item will interface. Modifications and Foreign Military Sales should be identified as such.

* **Decision supported** Describe the MS decision review, materiel release, or other decision being supported.

Description of test. Provide a brief description of test and test data required to answer preliminary concerns of the PM. (NOTE: The ORD can be provided to address these requirements.) Any additional pertinent documentation (for example, other test plans, performance specifications, etc.) that would assist in development of the scope of work should be referenced.

* **Test type.** Test types should reflect those identified in appendix B of this volume.

* **Test schedule.** Include quantity of test items and delivery date (month and year). If numbers cannot be provided, TECOM will provide the test program sponsor with the number used to compute cost estimates.

* **POC.** Name/organization/office symbol/phone number of the person responsible, both administrative and technical.

Funding. Indicate type of funds to be provided (for example, R&D, procurement, OMA) and associated funding code (Program Element/Task for R&D and OMA, standard study number).

Any known support requirements.

Subtest requirements.

Safety considerations.

Natural environmental & environmental quality considerations.

Desired test site.

Figure 4-1. Program planning forecast

The following information is required for Firm Test Requests (and can be tailored to reflect individual requirements):

Test item nomenclature (model number, lot number, short title, and acronym). Reflect the individual project title as identified in the Army Research, Development, and Acquisition Plan or other budgetary documents.

Item description. Identify unique characteristics which might require special test and analysis requirements. Include existing or planned systems with which the item will interface. State if a materiel change management program (citing MC number) or a Foreign Military Sales (cite FMS case number and country).

System life cycle phase. Identify the phase and/or the milestone decision review being supported by the test.

Funding. Type of funds to be provided (for example, R&D, procurement, OMA) and associated funding code (program element/task for R&D and OMA, standard study number for procurement).

References. Identify TECOM project number if previously forecasted and reference TEMP, IAP, military specifications, etc.

Description of test. Provide the test type, a brief description of the test, and test data required to answer preliminary concerns of the materiel developer. Include the appropriate test type as defined in appendix B. (NOTE: The requirement document can be provided to address these requirements.) Any additional pertinent documentation (for example, other test plans, specifications, MIL-STDs) that would assist in development of the scope of work should be referenced.

Test schedule. Include quantity of test items and delivery date (month and year). Provide any milestones requiring special consideration, such as required completion of testing, IAR due date, and so forth.

Report requirements. Indicate type of report required (that is, test record, abbreviated report, or formal report) and distribution requirements. Include TIR requirements.

Administrative and technical points of contact. Name, organization, office symbol, and telephone number.

Safety considerations. Address any safety problems and considerations concerning the test item. Provide a copy of the SAR. NOTE: Policy dictates that government developmental testing will not begin until an SAR has been received from the test sponsor and reviewed and accepted by the government organization performing the test (AR 385-16).

Environmental considerations. Cite any environmental considerations that might impact on the accomplishment of the requested effort and provide the appropriate documentation in accordance with the National Environmental Policy Act (NEPA) and AR 200-2 (for example, Record of Environmental Consideration, Record of Environmental Impact Statement, or Environmental Assessment).

Security considerations. Address applicable provisions of the security classification guide or security checklist and any applicable OPSEC requirements.

Figure 4-2. Firm test request

Chapter 5 Developmental Test and Evaluation Reporting and Documentation

Section I Developmental Test Readiness Review

5-1. Concept

The developmental test readiness review (DTRR) is conducted to determine if the developmental item is ready for developmental testing. As a minimum, the DTRR is conducted prior to PQT for materiel systems or SQT for information systems.

5-2. Developmental test readiness review working group

The DTRR working group, whose members include the parent TIWG members plus others as deemed appropriate, reviews all pre-start activities and requirements which may impact the execution of the test as planned by the TIWG. The objective of the review is to determine what actions are required to assure resources, training, and test hardware will be in place to support the successful conduct of the test, and to ensure that T&E planning, documentation, design maturity/configuration, and data systems have been adequately addressed.

a. The DTRR working group is typically composed of a representative from each of the following:

- (1) Materiel Developer (Chair).
- (2) Materiel Developer's Safety Office.
- (3) Materiel Developer's ILS Office.
- (4) MANPRINT representative.
- (5) Materiel Developer's Product Assurance and/or Testing Office.
- (6) Combat Developer/Functional Proponent.
- (7) Developmental Tester.
- (8) Operational Tester.
- (9) Developmental Evaluator/Assessor.
- (10) Operational Evaluator.
- (11) Logistician.
- (12) Trainer.

b. Others who may be requested to participate are:

- (1) Foreign Intelligence Officer.
- (2) DA Threat Integration Officer.
- (3) Transportability Evaluator.

c. The DTRR working group should be formed for all ACAT I and ACAT II programs. For ACAT III and ACAT IV programs, establishment of a working group is at the discretion of the materiel developer and the developmental tester. In cases where a full DTRR is not conducted, the materiel developer should conduct an internal DTRR to assure that the item/system can successfully complete the planned testing. This DTRR should be chaired by an independent organization within the command.

5-3. Procedures

a. The chairperson, after initial coordination with the membership, notifies and provides each member a DTRR package, ensuring that all considerations (see fig 5-1) have been addressed. Notification of the time and location of the review plus the DTRR package should be provided at least 2 weeks before the review to allow members to determine if representation by their organization is required and to effect preliminary internal coordination. Member agencies will determine the extent of their representation. Since all representatives may not attend each review, the chairperson may indicate recommended attendance.

b. As applicable, the DTRR package consists of the following documentation:

- (1) A TIWG coordinated TEMP.
- (2) Developmental IEPs/TDPs or IAPs and, if required, operational TEPs.
- (3) Detailed Developmental Test Plan.
- (4) Safety Assessment Report.

- (5) Applicable environmental documentation.
- (6) Current test hardware configuration.
- (7) RAM failure definition/scoring criteria.
- (8) A statement of the status of the system support package (SSP).
- (9) A statement of the status of New Equipment Training (NET).
- (10) A statement of the status of MANPRINT.
- (11) A statement of the status of instrumentation and data collection and reduction facilities.
- (12) An ILSMT approved Integrated Logistics Support Plan (ILSP).
- (13) An airworthiness statement.
- (14) A statement on the status of software.
- (15) Safety Release.
- (16) DT Threat Test Support Package.
- (17) Threat Accreditation Report.
- (18) Status of Transportability Statement.

c. After coordination with all participants, the DTRR working group will be convened at the call of the chairperson.

d. The DTRR working group makes recommendations regarding all issues regarding T&E planning. Each representative has the responsibility to advise participating members in test matters considered to be of mutual concern.

e. In the event of disagreement among the members, issues are presented to the chairperson for resolution through normal command/staff channels.

f. The chairperson provides minutes of the DTRR which include a developmental test readiness statement. This statement verifies that the system is ready for developmental testing, or if there are action items identified during the review that must be satisfied before test can begin, the minutes will identify such actions. The materiel developer will ensure that all requirements are satisfied before the test begins. The minutes, including all recommendations, issues, and required actions are distributed to each DTRR participant ten working days after the DTRR.

Section II Reports and Plans

5-4. Test incident reports and related reports

Timely reporting of test results is essential and is accomplished through Test Incident Reports (TIRs) as well as the formal test reporting procedures. Test incident data are prepared by the test organization (Government or contractor) to provide the results of any incident occurring during testing. In response, as a minimum, the materiel developer prepares corrective action data for all critical or major TIRs. Corrective action data reflect the developer's analysis of the problem and the status or description of the corrective action. All data are put into the Army Test Incident Reporting System (ATIRS) to enhance the continuous evaluation of the program. ATIRS is administered by the Aberdeen Test Center of the U.S. Army Test & Evaluation Command, at Aberdeen Proving Ground, Maryland. Details of test incidents and related reporting are contained in DA Pam 73-1.

5-5. Independent Evaluation/Assessment Plan

The developmental IEP/IAP is formulated by the independent developmental evaluator/assessor in close coordination with the TIWG members to ensure the intent of all technical parameters as provided in the TEMP is reflected.

a. *Contents.* The IEP/IAP, as a minimum, contains a brief system description, the technical parameters (both critical and noncritical), and criteria for the evaluation of each parameter; the approach and methodology for evaluation; data requirements/sources; a description of that portion of the evaluation which will require data from sources other than test; and identification of program constraints. The plan must address system performance, RAM, vulnerability/survivability, electronic interoperability, transportability,

MANPRINT, safety, horizontal system integration, integrated logistics support, human factors engineering, environmental effects, and so forth.

b. Technical parameters. As developmental evaluation issues (technical parameters) are satisfactorily resolved, they are retained and annotated in subsequent IEPs/IAPs. Those requiring more evaluation or revalidation are included in the next evaluation activity, and new issues are added, as appropriate. Data source matrices and test documents (if needed) are revised accordingly. The approved IEP/IAPs are furnished to all members of the TIWG. IEPs and associated TDPs, which are submitted to organizations external to the Army for review and/or approval, are forwarded through the Deputy Under Secretary of the Army for Operations Research (DUSA(OR)).

c. Live fire independent evaluation plan. IEPs for those systems undergoing LFT&E are prepared by AMSAA and must be approved by the DUSA(OR) six months prior to test initiation. When the detailed test plan for LFT&E is submitted for approval, the approved IEP must accompany the plan. The IEP should follow the basic LFT&E matrix plan approved in the TEMP. (See DA Pam 73-6 for details on LFT&E documents.)

5-6. Developmental Test Design Plan

The TDP guides the development of data required for the independent evaluation/assessment. It is prepared by the developmental evaluator/assessor and coordinated with the TIWG members. The TDP for combined tests should expand on both the developmental IEP and the operational TEP. For test programs being assessed by TECOM, the TDP is incorporated into the IAP.

a. Content.

(1) The TDP addresses all developmental test parameters and reflects all program constraints (dollars, test quantities, schedules, issues, and so forth.). Additionally, the TDP must spell out the form in which the data are needed and the accuracy with which it must be measured.

(2) The TDP must be adequate to permit the developmental tester to develop a detailed test plan in a timely manner to permit the development of test instrumentation/facilities, if necessary, with no program delays. It must clearly define the developmental evaluator/assessor's requirements for data. Detailed coordination between the evaluator/assessor and the developmental tester is necessary throughout the process.

(3) As a minimum, the TDP will contain the appropriate reliability test strategy, sample sizes, design of tests/experiments, minimum test requirements to measure performance specified, requirements for data and the process by which the data will be verified, and identify tests in order of priority to ensure that the more critical data are generated early.

b. Live fire test design plan. For test programs undergoing LFT, the TDP is prepared by AMSAA and must be approved by the DUSA(OR) six months prior to test initiation. When the detailed test plan for LFT&E is submitted for approval, the approved IEP/TDP must accompany the plan. (See DA Pam 73-6 for details on LFT&E documents.)

5-7. Developmental Detailed Test Plan

The developmental detailed test plan (DTP) is prepared by the developmental test activity. It is derived from and implements the IEP/IAP and the TDP, and provides explicit instructions for the conduct of developmental tests and subtests.

a. Coordination. The DTP governs test control, data collection, data analysis, and the necessary administrative aspects of the test program. The DTP must be coordinated with the appropriate developmental evaluators/assessors and may be coordinated with TIWG members to ensure that the evaluation/assessment reflects the requirements of the TEMP and TDPs. The DTP is approved by the test activity's parent command; if a contractor conducted test, the DTP is coordinated with the appropriate developmental evaluator/assessor and then approved by the materiel developer.

b. Content. As a minimum, the DTP should address the test

objectives, test concept, system description, test personnel requirements, test criteria, test schedule, and required coordination. Each subtest should be addressed separately, stating the criteria to be addressed by the subtest, the data to be obtained during the test, and the procedures to be used. The procedures should be described in sufficient detail to reflect what will occur during the test. Performance standards and test operating procedures (TOPs) should be used, if possible, and referenced in the DTP.

c. Live Fire detailed test plan. DTPs for LFT&E are also coordinated with the members of the LFT&E working group. After coordination with the working group and other members of the TIWG, two copies of the DTP, along with the previously approved IEP/TDP and the pre-shot prediction report, are forwarded to the DUSA(OR) for approval at least 60 days prior to test initiation. After approval, this package is forwarded to the Office of the Secretary of Defense (DOT&E) for approval. (See DA Pam 73-6 for details.)

5-8. Test report

The test report (TR) is provided by the contractor and Government test agencies to TIWG members and the decision review body at the conclusion of the test. For extended test phases, an interim test report is submitted for interim reviews. Test results must be comprehensive and complete before presentation to the milestone decision authority.

a. Requirements. As a minimum, final draft test reports, authenticated by the test agency head, are required prior to decision reviews. This is in consonance with policy regarding other documentation supporting the acquisition of a weapon system. A T&E review should occur 30 days prior to the decision review to review the adequacy of past tests, test results and evaluations, planning for future testing, and the modification of test strategy to accommodate the evolving acquisition strategy. Issues not resolved in this forum will be brought to the attention of the DUSA(OR).

(1) For ACAT I and other OSD T&E oversight programs, the developmental tester must submit the developmental test reports to OSD (DOT&E) through the DUSA(OR). If the test report is not available, an interim report will be submitted.

(2) The test activities that conducted the developmental tests prepare, approve, and publish the test reports. Test reports for contractor conducted developmental tests are approved by the materiel developer.

b. Content. The format of the formal TR parallels that of the DTP. An executive digest provides a summary of the significant findings, the test objectives and concept, and a description of the test item. Subtest results include, in addition to the objectives, criteria, test procedures, test findings, and a technical analysis of the data which relate to each subtest criteria addressed. Appendices include the test program criteria (from the DTP), and if required, lengthy test data presented as tables, charts, illustrations, etc. The formal test report may include a preliminary determination of deficiencies, shortcomings, and suggested improvements.

c. Expanded test report. For systems not selected for full evaluation, an expanded test report may be written in lieu of a formal IAR. The expanded test report includes evaluative statements by the developmental assessor. The expanded development test report includes a safety confirmation, conclusions, and recommendations instead of a separate evaluation.

d. Live Fire test report. For those systems undergoing Live Fire testing, the test report is also forwarded to the DUSA(OR) for approval. The approved test report must be forwarded to OSD within 120 days after test completion and 45 days prior to the full-rate production decision.

5-9. Independent Developmental Evaluation/Assessment Report

Developmental IER/IARs are prepared by the developmental independent evaluator/assessor and updated as additional data becomes available. Coordination of information contained in the IER/IAR between the testers and evaluators is effected to ensure that test data are accurately reflected in the IER/IAR. This process highlights

those issues that have been answered and assures the decision authority has the latest evaluation results. It is the “continuous” in continuous evaluation (CE). This process highlights those issues that have been answered and require little or no additional analysis, as well as those issues needing further evaluation.

a. Requirements

(1) The IER/IAR addresses both the critical technical parameters identified in the IEP/IAP and other issues which are appropriate to the specific item. It defines the methodology used to characterize materiel performance (effectiveness, RAM, survivability, mobility/transportability), logistics, MANPRINT, and safety.

(2) As a general rule, developmental IER/IARs are prepared prior to MS decision reviews. However, for very small programs, such as a simple modification, an expanded TR may suffice. This determination will be made jointly by the developmental tester and the developmental independent evaluator/assessor.

b. Content. IER/IARs contain, as a minimum, background and system description, the evaluation/assessment of each technical parameter (both critical and noncritical), the safety confirmation, and conclusions and recommendations.

5-10. Outline Test Plan

The outline test plan (OTP), as defined in DA Pam 73-5 is generally required to obtain operational testing resources; however, if DT requires the use of user troops beyond DT resources, the developmental tester also prepares a draft OTP to obtain troop and equipment support. This will permit early planning for the resources to be provided through the Test Schedule and Review Committee (TSARC) process and for resource support through the Five-Year Test Program (FYTP) process. (See AR 15-38.)

a. User troops may be provided by U.S. Army Forces Command (FORSCOM), U.S. Army Training and Doctrine Command, U.S. Army Pacific Command, and so forth.

b. All acquisition programs must have an Army-approved TEMP prior to competing in the TSARC process.

5-11. Test & Evaluation Master Plan

The developmental testers and evaluators/assessors are primary players in the development of the TEMP. (For additional guidelines on the TEMP, see DA Pam 73-2.)

a. Developmental test and evaluation input.

(1) As input to Part I of the TEMP, the independent developmental evaluator/assessor, in coordination with the combat developer, the materiel developer, and the developmental tester, develop the critical technical parameters.

(2) Both the evaluators/assessors and the testers provide support to the materiel developer in the development of Part II of the TEMP, the Integrated Test Program Summary.

(3) Part III of the TEMP, the Developmental T&E Outline, which provides an overview of the entire DT&E program, is developed jointly by the developmental tester and the developmental evaluator/assessor. This section of the TEMP outlines the objectives of DT&E, identifies the DT&E that has been completed, discusses the DT&E to be conducted with emphasis on the next phase of the acquisition cycle, and includes a description of LFT&E, if applicable.

(4) The developmental tester and evaluator/assessor have a substantial role in the development of Part V of the TEMP, the T&E Resource Summary, which provides a summary of all T&E resources to include:

(a) Test articles. The developmental evaluator/assessor, in coordination with the developmental tester, identifies the number of test articles required and when they will be needed.

(b) Test sites and instrumentation. The developmental tester, with support from the evaluator/assessor, identifies the test range/facility and the instrumentation that will be required for each test to be conducted. Details on acquiring needed instrumentation are in DA Pam 73-1.

(c) Test support. The developmental tester determines what support equipment is required, and if not available, what must be acquired for the specific test program.

(d) Threat systems/simulators. The developmental tester assists the foreign intelligence officer in determining the requirements for and availability of current assets and the sufficiency of those capabilities.

(e) Test targets and expendables. The developmental tester identifies the type, number, and availability requirements for targets and other expendables, including ammunition, threat targets for lethality testing, and threat munitions for vulnerability testing. Details for obtaining necessary targets and threat simulators are outlined in chapter VII.

(f) Simulation, models, and testbeds. The developmental evaluator/assessor identifies the system simulations required for the developmental T&E and the resources required to validate and certify their use.

(g) Special requirements. The developmental evaluator/assessor, in conjunction with the developmental tester, identifies any significant non-instrumentation capabilities required for the developmental T&E.

(h) T&E funding requirements. The developmental tester provides an estimate of the funding required to pay direct costs for the developmental tests required to be conducted at government ranges and test facilities.

(i) Manpower/personnel training. The developmental tester identifies the key manpower/personnel and training required for developmental T&E. These requirements must be identified, to the degree known, at MS I.

5-12. Summary of developmental test and evaluation documents

There are many documents required to plan and report on the T&E that takes place during the life cycle of a system. To provide a summary of the specific documents required within the DT&E arena, a list of planning, reporting, and supporting documents is provided at appendix D. This list provides the name of the document, the source reference, the activity with primary responsibility for the document, and a brief summary of the document and its purpose.

The following factors should be taken into consideration when preparing a DTRR package for a PQT on an ACAT I or II program. This list should be modified for ACAT III and IV programs as required.

1. General - Review program requirements compared against test results to date. There must be a reasonable assurance (confidence) that the system to be tested can satisfactorily pass developmental test or equivalent independent government tests.

a. Previous data sources should indicate that system requirements can be met. (Consider quantities tested, what tests were conducted, and results.)

b. All system requirements must be addressed.

c. All critical/major problems identified in TIRs from previous testing should have been corrected and verified. (List and summarize corrective actions.)

2. Safety

a. A SAR (AR 385-16) and a HHA (AR 40-10) must be submitted to the testing agency.

b. A SSWG should have been formed.

c. System safety limitations (operational limitations for test personnel) should be identified, either inside or outside the required performance envelope. Corrective action should have been taken or be planned.

d. Critical defects found during manufacture/loading/inspection of the items should be identified.

3. Reliability, availability, and maintainability

a. Reliability and maintainability predictions should be included.

b. Reliability growth goals should have been met.

c. Critical components identified and component testing conducted.

d. An independent RAM assessment conducted.

e. Failure definition/scoring criteria established.

4. Configuration management

a. A preliminary product baseline technical data package should have been established.

b. A configuration management plan should be in place which includes provisions for Government approval of engineering change proposals and waivers/deviations.

c. A Configuration Control Board should have been established.

Figure 5-1. Considerations in Preparation for the Development Test Readiness Review (DTRR)

5. Electromagnetic environmental effects (E3)

- a. E3 criteria should have been established.
- b. Approved E3 criteria should be included in T&E planning.

6. Hardware

- a. Quantity of items for testing determined. A statistical basis for the quantity should have been established.
- b. Hardware conformance to the baseline evaluated. A physical configuration audit should have been conducted. Consideration should be given to how many items and the results.
- c. Test item configuration should be compared with items previously tested.
- d. Any unresolved risks should be identified.
- e. Human factor evaluations should have been conducted.
- f. Unique (nonstandard, new, or proprietary) processes identified.

7. Software

- a. Configuration items related to software should have been identified and controlled.
- b. All software test plans/procedures/test results should have been reviewed/approved by Government.
- c. All functional requirements should be clearly identified.
- d. Confidence that software functions will execute properly (walk-throughs, design specs, program performance specs, B5/C5 MIL-STD-490 specs, interface specs, resource allocations)?
- e. A clear understanding should exist of what software functions will be tested by the developmental and operational testers.
- f. If applicable, the Computer Resource Management Plan should be current.
- g. Plans should have been formulated to deliver all software documentation prior to DT/OT.

8. Test documentation

- a. The detailed test plan should address all critical technical parameters and be approved.
- b. If required, the Human Use Committee should have approved the detailed test plan.
- c. Airworthiness and safety releases should be provided.
- d. Required environmental documents should have been received.
- e. Instrumentation plans should be prepared and approved.
- f. If required, outline test plan should have been prepared and submitted

Figure 5-1A. Considerations in Preparation for the Development Test Readiness Review (DTRR)--Continued

9. Integrated logistics support

a. Supportability.

(1) SSP Component List (SSPCL) prepared and coordinated with all concerned agencies. (See AR 700-127.)

(2) All items on the SSPCL available at each test site prior to test, or a waiver approved.

(3) All manuals (including drafts) available, including those for support equipment, associated equipment software, and TMDE.

(4) A logistics demonstration conducted.

(5) Testing for supportability included in the TEMP, OTP, TDPs, and IEPs?

(6) Field support equipment should be available for test.

b. Transportability Testing. System transportability needs should be identified (including such requirements as lifting and tiedown provision strength, helicopter lift, Air Force aircraft loading, air drop, and rail impact).

10. MANPRINT

a. MANPRINT analyses conducted.

b. System MANPRINT management plan prepared.

c. Human Factors engineering analysis accomplished.

d. Training.

(1) NET for test personnel accomplished prior to the start of DT.

(2) NET TSP prepared. (See AR 73-1 and DA Pam 73-8 (forthcoming).)

(3) Training devices, aids and/or equipment needed by NET personnel available.

e. Soldier survivability should be addressed.

11. Test resources

a. Required agencies should be funded for the test.

b. Unique facilities/equipment instrumentation required should be available at the test site(s).

c. Sufficient test articles must be available.

d. Sufficient targets and threat simulators should be available.

e. Required targets and threat simulators validated and accredited for this test.

Figure 5-1B. Considerations in Preparation for the Development Test Readiness Review (DTRR)--Continued

Chapter 6 Developmental Test and Evaluation Considerations

6-1. Reliability, availability, and maintainability

The operational RAM values specified by the requirements documents are translated into technical requirements by the RAM rationale working group. The technical RAM requirements are translated into DT&E requirements by the independent developmental evaluator/assessor. Plans must be specifically oriented to provide the test data required to assess the probable achievement of the RAM values. DA Pam 70-3, provides details on the process for establishing and managing RAM throughout the life cycle of Army materiel systems.

a. RAM scoring conference. RAM scoring conferences are held before publication/release of the test report and are chaired by the materiel developer for DT and by the operational evaluator for OT. Voting members are the operational evaluator, developmental evaluator, materiel developer, and combat developer. The failure assessment data is obtained from the TIRs and the corrective action data. (See DA Pam 73-1, chapter 10 for details on TIR preparation.) Decisions are made by a majority vote of the primary spokespersons. If unresolved differences exist, the dissenting opinions are formally documented in the conference minutes. In cases where a majority opinion does not exist, the operational evaluator makes the final determination of scoring incidents for OT, and the developmental evaluator, for DT. Appendix C provides the procedures used to conduct a scoring conference.

b. RAM assessment conference. RAM assessment conferences, when convened, are chaired by the operational evaluator and are held before release/publication of the test report. Attendees at this conference are the same as for the scoring conference. This conference is conducted to discuss and establish the test database, the procedures to be used in assessing the data, and the demonstrated RAM estimates. The assessment conference is conducted under guidelines similar to those used for scoring conferences, except there is no tie breaking vote. Any changes to the test database must be by majority opinion. If there is no majority opinion, each member reports his/her own assessment. Minutes of the conference are provided to all attendees. Appendix C provides the procedures used to conduct an assessment conference.

6-2. Electromagnetic environmental effects

a. To ensure that Army materiel is in compliance with electromagnetic environmental effects (E3) policy, testing under the purview of an Army tester, an independent evaluator/assessor, and ARL-SLAD will be conducted. Evaluations/assessments will be used to determine the probable inter- and intra-system E3 hardness, as well as provide guidance and theoretical pretest predictions. Early DT&E planning will ensure the use of scheduled tests to fully assess the E3 criteria rather than requiring new or increased testing. See DA Pam 73-8 for further details on E3.

b. Army materiel that transmits on a frequency should be in compliance with the radio frequency regulatory provisions, procedures, and standards. Testing and/or analysis should be conducted to determine compatibility in the intended spectrum environment.

6-3. Significant impact tests

a. Significant impact tests or demonstrations, that is, those involving multiple participants, multinational involvement, and those with potential multinational impact require careful planning, staffing, coordination, and approval. These events require detailed attention to the technical aspects and performance of the tests and demonstrations and the early involvement of policy makers.

b. Prior to the announcement of initiation of significant impact tests, coordination must be effected with both the DUSA(OR) and the Army Acquisition Executive. In this way, it is ensured that Army policy makers are allowed to review and approve the planning

to include public affairs or Congressional notification and news media planning.

6-4. Manpower and Personnel Integration (AR 602-2)

Throughout the acquisition process, MANPRINT will be a factor in all T&E planning. Developmental testing will be planned to provide data for the assessment of issues regarding the integration of all MANPRINT domains; that is, human factors engineering, manpower, training, system safety, health hazards, personnel, and soldier survivability. This assessment will determine if the item can be adequately operated and maintained by soldiers representative of the target users, with the proposed system training, and under the expected environment.

6-5. Logistic Supportability (AR 700-127)

Evaluation of materiel supportability is mandatory during both DT and OT. The scope of the evaluation/assessment varies depending on the characteristics of the system and where the program is in the acquisition cycle. The materiel developer, in coordination with the logistician, developmental evaluator/assessor, and combat developer will establish the logistic support parameters to be addressed during test as well as the scope of testing required in each acquisition phase. The system support packages (SSP) provided for developmental test and evaluation/assessment will represent the logistic support system that will be provided when a system is deployed in the field. (See DA Pam 73-1 for more detailed information on SSPs.)

6-6. Transportability (AR 70-44, AR 70-47, and AR 700-127)

a. Transportability refers to the ability of a system to be moved by towing, self-propulsion, or by carrier via railway, highway, air, waterway, or helicopter, and airdrop modes of transportation utilizing existing or planned transportation assets. Transportability testing is accomplished to support the assessment efforts of the Military Traffic Management Command's (MTMC) Transportation Engineering Agency and to obtain a transportability approval from MTMC. This testing also supports certification for external air transport by rotary-wing aircraft, internal air transport by fixed-wing and rotary-wing air transport, and airdrop. These certifications are required prior to transportability approval.

b. The transportability evaluator works closely with the acquisition community through the Integrated Logistics Management Team (ILSMT), TIWG, and other program review forums to provide a continuous assessment of transportability for all assigned acquisition programs (DA Pam 73-8, chap 1).

6-7. Health Hazard Assessment (HHA) (AR 40-10)

Developmental testing provides data regarding personnel health hazards inherent in the operation and maintenance of the system. Planning for this testing must be considered early in the cycle and continues throughout the acquisition process. Special attention is given to verifying the adequacy of safety and warning devices and any other measures to control hazards. An HHA report is developed by the U.S. Army Center for Health Promotion and Preventive Medicine from data gathered from a variety of sources and includes the results of developmental tests and operational tests to date. The HHA report supports the preparation of the Safety Assessment Report (SAR) and is requested by the materiel developer. HHA issues are addressed in the developmental IEP/IAPs, DTPs, and IER/IARs.

6-8. System Safety Testing (AR 385-16)

One of the most important objectives of developmental testing is verifying the elimination or control of safety and health hazards. The developmental tester must review the provisions of MIL-STD 882 when formulating the testing program, determining the operational environment, and establishing operator limits.

a. Safety Assessment Report.

(1) Prior to developmental testing, a SAR is prepared by the

materiel developer. The SAR is the formal, comprehensive safety report which summarizes the safety data that have been collected and evaluated thus far. It expresses the considered judgment of the contractor or developing agency regarding the hazard potential of the item, and any actions or precautions that are recommended to minimize these hazards, and to reduce the exposure of personnel and equipment to them.

(2) The SAR is provided by the materiel developer to the combat developer, OT agency, and DT agency at least 60 days before start of their respective tests. Government DT will not begin until a SAR has been received, reviewed, and accepted by the test agency. The test agencies —

(a) Use the SAR information to integrate system safety into test planning and into procedures, and for shipping and handling of the system.

(b) Ensure that DT does not begin until a SAR has been received, reviewed, and accepted by the test agency.

(3) The SAR format is provided in figure 6-1. Tables 6-1 and 6-2 are provided to assist in determining the appropriate categorization of hazard severity and level of hazard probability, which are reflected in the SAR.

b. *Safety testing.* Developmental testing for safety is characterized by systematic testing of materiel using highly technical equipment and instrumentation under laboratory or other rigorously controlled conditions. The tester obtains the hazard tracking list (see DA Pam 385-16 for guidance on structure and procedures for hazard tracking) before starting developmental testing. This list is used with the SAR to identify the remedies that have been applied to correct previously identified hazards. Safety tests are then performed to verify the adequacy of the remedy. Specific safety tests are also performed on critical devices or components to determine the nature and extent of hazards presented by the materiel. All safety testing will be conducted according to the appropriate test operating procedures/international test operating procedures (TOPs/ITOPs), as applicable. Use of standard test procedures, as developed in TOPs/ITOPs ensures usability and adequacy of the test data in addressing the safety test objectives.

c. *Safety release.* No testing (developmental or operational) involving troops will begin until a safety release has been issued to the test organization. For operational testing, the materiel developer should request a safety release as soon as the requirement is known. TECOM is responsible for issuing all safety releases except for systems being developed by ISC, HSC, and the Medical Research Development Command.

(1) The safety release is a formal document issued to a test organization before any hands-on use or maintenance by troops is allowed.

(2) The safety release indicates that the system is safe for use and maintenance by typical user troops and describes the specific hazards of the system or item based on test results, inspections, and system safety analyses. Operational limits and precautions are included. The test agency uses the data to integrate safety into test controls and procedures and to determine if the test objectives can be met within these limits.

(3) A limited safety release can be issued on one particular system.

(4) A conditional safety release is issued when further safety data are pending; for example, when all safety tests have not been completed and certain aspects of the test employing troops must therefore be restricted.

(5) The safety release is in the format shown in figure 6-2.

d. *Safety confirmation.* Prior to a MS decision or a materiel release decision, a safety confirmation is provided to the decision maker as part of the IER/IAR. The safety confirmation evaluates the safety findings, states whether the specified safety requirements have been met, and evaluates the risk of proceeding to the next phase of the acquisition cycle. The safety confirmation is provided by the government developmental tester.

e. *References.* Additional details pertaining to system safety are contained in AR 385-16 and DA Pam 385-16.

6-9. Range safety data

a. To minimize the possibility of accidents during firing and other uses of ammunition and explosives, Army weapons, munitions, and lasers require the development of range devices and safety data to ensure safe and effective testing, peacetime training, target practice, and simulated tactical employment (AR 385-62 and AR 385-63).

b. The surface danger area diagram (safety fan) is provided by the materiel developer; however, the test facility may assist in developing the hazardous areas. These safety fans are verified during developmental testing. The verification must be available before operational testing with troops. It is critical that sufficient ammunition or explosive devices be scheduled for use in the development of these data (AR 385-16).

6-10. Use of Nontest Personnel and Volunteers in Developmental Testing (AR 70-25)

The safety of test personnel is of paramount concern during testing. Test designers ensure that testers are protected from risks in the performance of their testing duties by scrutiny of the SAR and safety release and review and approval of detailed test plans. AR 70-25 requires review of test plans by a Human Use Committee (HUC) when: testing involves greater than minimal risk or tests are being conducted by military or civilian personnel not qualified to test by duty assignment when the test calls specifically for such qualifications.

a. The HUC reviews and recommends the test plan approval authority either approve, approve with modifications, defer review to higher authority, disapprove, or exempt from further review.

b. If a HUC determines that the level of risk is greater than minimal, requiring the test participants to be volunteers, the test plan is forwarded to Department of Army for review and submission to the Secretary of the Army for approval or disapproval.

c. HUCs are established and function according to AR 70-25 at OPTEC, TECOM, USAISC, and USASC. These commands provide to HQ DA (TEMA) the membership and administrative procedures established for each HUC.

d. After a HUC has determined minimal risk, AR 70-25 allows the HUC to recommend exemption from further human use review. If such a determination is made, further review of the system will not be required unless the program manager, developmental tester, or operational tester determines that changes in the item, test planning, or the method of employment warrant further review.

e. If the HUC determines that a system is exempt from further HUC review, the PM will include that determination in Part II of the TEMP.

f. The HUC will determine the level of risk based on review of the system/item in the context of the planned testing (based on the test plan), the safety release, the doctrine, tactics, method of employment, and the test methods to be followed.

6-11. Natural Environmental Testing (AR 70-38)

Environmental testing parameters are derived from the requirements documents and are tailored to each specific system (MIL-STD 810). Test results may be derived from environmental chamber tests or from tests conducted in the natural environment.

a. *Chamber tests.* The use of environmental chambers for some tests can be an effective screening mechanism early in the development of the item. Appropriate environmental chamber/laboratory tests are scheduled early in the acquisition cycle to screen materials, components, or entire items for possible problems with item design. However, chamber tests can only provide data to assist in the development of an item and are not a substitute for the real world environment.

b. *Benefits of testing in the natural environment.* Chamber testing and natural environmental testing complement each other. The natural environmental test facilities offer an opportunity to test complete systems in a realistic manner. The effects of many environmental

variables can be seen at once; mission profiles can be followed. AR 73-1 requires that climatic tests under the "basic" climatic design type conditions be completed prior to type classification standard.

c. Climatic design types. Developmental test programs must be designed to include the basic environmental conditions and all the capabilities and limits for which the system is designed. As a minimum, Army weapon systems are designed for the basic climatic design type. The Army recognizes four climatic design types: hot, basic, cold, and severe cold. Generally, all Army equipment must operate in at least the basic climatic design type. Potentially dangerous items (for example, ammunition) will be tested for safety in all climatic design types without regard for the likelihood for being used in those climates.

d. Basic climatic design type. A condensation of the environment descriptions in AR 70-38 for testing in the basic climatic design type is reflected in table 6-3. In order to take maximum advantage of the testing season for the basic climatic design type at the Army's natural environmental test centers, the following must be considered:

(1) *Basic cold.* The winter testing season at the Cold Regions Test Activity (Alaska) is from mid-October through mid-March. Test hardware must be delivered by the beginning of the test season (1 October). Items received after December are not assured of an adequate test season.

(2) *Constant and variable high humidity.* There are two testing seasons for the Tropic Test Site in Panama. The wet testing season runs from April-November. A drier testing season runs from December-March. The materiel developer should plan for a test of several months for tropic testing in order to realize the synergistic effects of the tropic environment throughout both seasons.

(3) *Basic hot.* The optimum testing season at Yuma Proving Ground for these effects is from mid-May through mid-September. Test hardware must be delivered by the beginning of the test season. Items received for test after July are not assured of an adequate test season.

e. Semi-protected environments. Information systems or subsystems which will be operated in semi-protected environments, such as forward area command centers, are also subject to these provisions. Information systems installed and operated in a protected environment do not come under these provisions; however, environmental control units supporting information systems requiring a special environment must be tested or certified by the providing agency to ensure capacity, suitability, and continued support.

6-12. Integrated testing

The integration of test requirements (that is, combined or concurrent developmental testing/operational testing) mandates a coordinated effort by all members of the acquisition community to ensure that testing is optimized. While developmental testing and operational testing are separate activities conducted by different test communities, they interact frequently and are complementary. Each provides a unique perspective on a program. The decision to conduct concurrent or combined testing is made by the TIWG, and each acquisition program must be looked at individually to determine if this is feasible.

a. Concurrent Developmental Test/Operational test. DT and OT are normally conducted with some degree of concurrence creating a challenge to the testing community to ensure that separate and different test objectives are accomplished without duplication. Concurrent testing usually means that separate DT and OT are being conducted on separate prototypes during the same period of time. Some duplication may be avoided; however, care must be taken to ensure the integrity of both DT and OT data. Sufficient DT must be done to ensure system readiness for OT and to support a safety release.

b. Combined Developmental Test/Operational Test. Combined DT/OT is conducted simultaneously on the same hardware and software. In those instances when developmental testing and operational testing can be combined to save resources, the separate test objectives must not be compromised. In some cases, DT conducted

utilizing soldier, operator, maintainer test personnel, bringing an operational flavor to the DT, will satisfy the test objectives of the OT.

c. Independent evaluations. Whether conducting DT and OT concurrently or in combination, the integrity of the separate independent developmental and operational evaluations must be ensured.

6-13. Test data confirmation

The purpose of test data confirmation is to ensure the widest possible use of data. The TIWG first determines whether or not a need exists to confirm certain test data. A review of each test is performed and the criticality of the use of the data is assessed. This determines which tests require confirmation so the data generated can be used for evaluation purposes. Test data confirmation is determined by the TIWG.

a. Acceptability of data. In those instances when a particular facility's ability to provide acceptable data is in doubt, the government developmental tester, the materiel developer, and the independent evaluator/assessor, if appropriate, inspect the facility to verify acceptability of data. For this reason, it is essential that the TIWG review and coordinate on the T&E portion of the RFP prior to its issuance. The following factors are considered in determining the acceptability of the test data that will be generated:

(1) Ranges, courses, test apparatus, and support equipment available to tester.

(2) Laboratory facilities, instrumentation, and calibration available to tester.

(3) Test personnel experience and expertise, test procedures, and data collection and reporting procedures used by tester.

b. Government monitoring. In those instances when the test data from a particular source or procedure would not otherwise be acceptable, the independent evaluator may require the test to be conducted by government test personnel or that the data be validated through monitoring by government test personnel.

c. Confirmation process. Once the confirmation process has been established, the materiel developer relies upon the government developmental tester to provide assistance in contractual proceedings. Prior to bid solicitation, the materiel developer:

(1) Provides the T&E portion of the RFP to TIWG members for coordination and to confirm test data acceptability.

(2) Provides to prospective contractors, in the RFP, the option of using government test services, funded directly by the materiel developer. This provides flexibility to the contractors and gives the TIWG a known source of acceptable data, should other sources prove unacceptable.

d. Contract requirements. To help ensure acceptability of test data, contracts specify that the contractor:

(1) Provide a test plan to the materiel developer for TIWG coordination prior to testing.

(2) Report test incidents to the materiel developer and evaluators.

(3) Report the corrective actions taken in response to test incidents to the materiel developer and evaluators.

(4) Provide a test report to the materiel developer and evaluators. (If contractor test data will be used to satisfy certain technical requirements, a copy of the contractor test report should be provided to the government developmental tester by the materiel developer.)

6-14. Environmental impact (AR 200-2)

Formal environmental documentation is required by Congressional mandates to support all Federal agency actions. Therefore, prior to the initiation of any testing, environmental documentation must be provided by the materiel developer to the developmental tester in accordance with AR 200-2.

a. Categorical exclusions. Actions that do not require an environmental assessment or an environmental impact statement and have been determined not to have an individual or cumulative impact on the environment may qualify for a categorical exclusion. AR 200-2 contains a list of such actions. A Record of Environmental Consideration (REC) documents this decision.

b. Environmental documentation. Appendix D of this pamphlet

provides information on the three levels of environmental documentation which can be submitted. Detailed information and requirements pertinent to environmental documentation are contained in AR 200-2.

6-15. Threat considerations

Threats must be identified, approved, and updated continuously throughout the life cycle (AR 381-11). DA-approved (DA DCSINT) threat or system-specific threat definitions developed in accordance with appropriate regulations, will be employed when tests are planned, designed, and conducted. (Refer to Chapter 4, DA Pam 73-8 (forthcoming) for detailed guidance on threat considerations in T&E.)

6-16. Airworthiness Qualification Testing (AR 70-62)

An airworthiness release is required before the operation of aircraft in the performance of official duties. Developmental T&E supports this release by demonstrating or verifying compliance with applicable aeronautical design standards, demonstration addendum, and other technical parameters cited in contracts.

**Table 6-1
Hazard Severity**

Description	Category ¹	Mishap Definition
Catastrophic	I	Death or system loss.
Critical	II	Severe injury, severe occupational illness, or major system damage.
Marginal	III	Minor injury, minor occupation illness, or minor system damage.
Negligible	IV	Less than minor injury, occupational illness, or system damage.

Notes:

¹ These hazard severity categories provide guidance to a wide variety of programs. However, adaptation to a particular program is generally required to provide a mutual understanding between the materiel developer and the contractors as to the meaning of the terms used in the category definitions. The adaptation must define what constitutes system loss, major or minor system damage, and severe and minor injury and occupational illness.

**Table 6-2
Hazard Probability Levels**

Description ¹	Level	Specific Individual Item	Fleet or Inventory ²
Frequent	A	Likely to occur frequently	Continuously experienced
Probable	B	Will occur several times in life of an item	Will occur frequently
Occasional	C	Likely to occur sometime in life of an item	Will occur several times
Remote	D	Unlikely but possible to occur in life of an item	Unlikely but can reasonably be expected to occur
Improbable	E	So unlikely, it can be assumed no occurrence may be experienced	Unlikely to occur, but possible.

Notes:

¹ Definitions of descriptive words may be modified based on quantity involved.

² The size of the fleet or inventory should be defined.

**Table 6-3
Basic Climatic Design Types**

Daily Cycle	Temperature (degrees F)	Solar Radiation (BTU per hr)	Humidity (%)	Storage Temperature (degrees F)
Basic Hot	86-110	0-355	14-44	86-145
Basic Cold	-5 to -25	Negligible	Toward Saturation	-13 to -28
Constant high humidity	75 (constant)	Negligible	95-100	80 (constant)
Variable high humidity	78-95	0-307	74-100	86-145

I. INTRODUCTION: State the purpose.

The purpose of the SAR is to provide a comprehensive evaluation of the safety risks being assumed prior to test or operation of the system or at contract completion. It should identify all safety features of the hardware and system design and procedural hazards that may be present in the system being acquired. It should include specific procedural controls and precautions that should be followed.

II. SYSTEM DESCRIPTION: Develop by referencing other program specifications; such as the IEP/IAP, test plan, TEMP, and TMs, system safety program plans, specifications, and so forth., as applicable and --

A. State the purpose and intended use of the item. The description of the system should begin with its intended use and the mission that it is required to accomplish.

B. Give background information on development of the item. Provide an historical summary of the system's development.

C. Describe the item fully. Include name; type; model number; presence of any radioactive source; general physical features including size, weight, payload; and specific operational features. Describe major subsystems and components.

D. Describe fully the system that will be tested along with the item. For example, a weapons system may need to be tested while mounted on a specific vehicle. While the vehicle may already be a fielded item, its interface with the weapon system needs to be evaluated.

E. Provide photos, charts, flow diagrams, or schematics to support the system description, test, or operation.

III. SYSTEM OPERATIONS:

A. Present a complete sequence of system operations and emphasize the safety features. A system is designed, manufactured, and maintained to accomplish a specific mission. It has certain characteristics and limitations within which it will function properly. Procedures which should be followed in sequence for safe operation should be spelled out so that important steps are not by-passed. Hazardous operations should be conducted only in designated areas. Only essential personnel should be permitted within the hazard area during a specific operation. Personnel and organizations should be notified before the operation is begun. Escape routes should be clearly designated.

B. List and fully describe any special procedures needed to assure safe operations, including emergency procedures. For example, misfire/hang, fire/cook-off procedures or warnings should be provided for all weapons, as well as load/stow/reload procedures.

C. Describe operating environments and specific skills for safe operation, maintenance, or disposal.

D. Describe special facility requirements or personal equipment to support/operate the system; for example, fire suppression system, climate control, ventilation, ear or eye protection, gloves, clothing, and so forth.

Figure 6-1. Safety Assessment Report Format

IV. SAFETY ENGINEERING:

A. Include all system safety data and include contractor safety data developed during design and development phases.

1. The system safety engineering process may begin with known previous experience and knowledge. The lessons learned from previous system developments should be made available for the hazard analysis. Other data available from common resource banks, such as Government defense and industry, should be considered.

2. As long as hazards exist, there is the possibility, no matter how improbable, that an accident will occur. Accidents are possible when the system or its components are being tested during development; however, tests are usually carried out by highly trained personnel who are alert to the possibility that failures at that stage are likely. But when the system becomes operational, the operational personnel may be less cautious, knowledgeable, or capable of meeting emergencies. Designers must therefore recognize that in the hands of the ultimate user, the probability of accidents is greater.

B. Show analyses and tests performed to point out hazardous conditions in the item. Hazard analyses are the heart of the system safety evaluation. The types of analyses that were performed must be stated in this section and the purpose must be clearly defined. Since there are many types of hazard analyses, a specific attempt to understand the system and the need to perform unique types of analyses should be made.

1. Show hazard severity and the effect of hazards on system operation and mission. Hazard severity and probability of occurrence should be categorized as follows --

a. Hazard severity. Hazard severity categories provide a qualitative measure of the worst credible mishap resulting from personnel error; environmental conditions; design inadequacies; procedural deficiencies; or system, subsystem or component failure or malfunction as shown in table 6-1.

b. Hazard probability. The probability that a hazard will be created during the planned life expectancy of the system can be described in potential occurrences per unit of time, events, population, items, or activity. Assigning a quantitative hazard probability to a potential design or procedural hazard is generally not possible early in the design process. A qualitative hazard probability may be derived from research, analysis, and evaluation of historical safety data from similar systems. Supporting rationale for assigning a hazard probability will be documented in hazard analysis reports. An example of a qualitative hazard probability ranking is shown in table 6-2.

2. Explain system interfaces and associated safety implications. The human/machine/hazards need to be examined and all of the system's interfaces should be pointed out. Understanding the need for a complete evaluation of hazards to assure that controls are considered in the preliminary hazards analysis is vital. System definition will initially result in a suitable general design. It is understood that all hazards may not be recognized at this time; however, this analysis should be continuously upgraded as the development phase progresses. Catastrophic hazards should be considered as a source of fault tree analysis so that the events leading to the undesired event can be traced.

Figure 6-1A. Safety Assessment Report format--Continued

3. Show the results of hazard analysis validation tests. The method by which safety controls are brought into existence must be stated in a clear, positive policy. It will be necessary to verify that the particular design meets the safety requirements specified. A safety test matrix which identifies the particular areas that were tested, along with the results and actions to abate the hazards, should be present.

C. Include surface danger zone data and other range safety data for weapons or explosive items and sources of nonionizing/ionizing radiation. This section encompasses a wide variety of possible safety hazards which may or may not be an integral part of the system. If the system relates to any of the above, the information must be included. The following data needs to be considered --

1. General range control precautions, instructions, and danger zones necessary during firing and other uses of the ammunition and explosives in all types of test operations utilizing water, airspace, and assigned land areas.

2. Lasers are an example of nonionizing radiation. Three aspects of laser application which influence the total hazard evaluation are the laser system capability of injuring personnel, the environment in which the laser is used, and the personnel who operate the laser and the personnel who may be exposed.

3. Any ionizing radiation hazards that may be present within the system or develop as the result of operating or maintaining the system must be identified. Methods of safeguards need to be communicated.

D. When the program sponsor states that the test presents no hazard, include the basis for this decision and supporting evidence. In most cases some form of hazard analysis should be performed before determining that no hazards exist. It is not enough to compare the system in question to some other system that was previously fielded. Copies of all analyses and test reports should be included as evidence.

E. Health hazards.

1. Address any known or potential health hazards to test participants as a result of the design or use of the system.

2. Include results (attach if available) of mandatory health hazards studies made by medical agencies (AR 40-10). Also, include results of medical research or consultations made to clarify the nature and degree of the hazard to user personnel. Examples would include test for toxic gas concentrations, noise levels (including impulse as well as steady state), and radiation measurements.

F. Indicate whether the restrictions for human use volunteers (AR 70-25) apply.

Figure 6-1B. Safety Assessment Report Format--Continued

V. CONCLUSIONS AND RECOMMENDATIONS:

A. State whether the system is completely safe for testing or whether it is safe for testing with exceptions. It should be remembered that test personnel, during both DT and OT, must operate, fire, evaluate, etc., the materiel to be tested, and it is necessary for their safety and the safety of military personnel who will later use the system, that they understand all of the peculiarities of the system. It is in this section that all known or suspected hazards need to be summarized along with safeguards needed to protect users against serious injury or loss of the system.

B. List exceptions for all real and potential hazards that may be encountered. Make specific safety recommendations to ensure the safety of personnel and the preservation of materiel and property.

1. Related hazards should be classed as expected to occur under normal or abnormal operating conditions.

2. Explosive, electrical, mechanical, health, radiological, and composite hazards should be covered.

VI. REFERENCES

List references, such as TRs, preliminary operating manuals, maintenance manuals, and health hazard studies.

VII. SIGNATURE BLOCKS:

The SAR should be signed as stated below --

Prepared by: Matrix Support Command Date

Concurred by: Safety Officer Date

Approved by: Program Manager Date

Figure 6-1C. Safety Assessment Report Format--Continued

I. Purpose (of this safety release).

II. References.

III. System description. Give the name, type, and model number of the system and also the system's mission. If a component, name the parent system. State the specific test for which the safety release will be issued (for example, the test number as it appears in the FYTP).

IV. Requirements and background.

- A. Requirements and procedure to conduct testing safely including range safety fans (OT only).
- B. Background and testing (DT only).
 - 1. If an SAR was provided for the system, it will be enclosed or referenced by the safety release. If no SAR exists, identify that fact.
 - 2. Summarize testing done or other basis (such as analyses or inspections) for the safety release.
 - 3. State results of testing, safety problems, and significant incidents.
 - 4. Define or enclose development data to assist in preparing range safety fans, requirements, and procedures.

V. Conclusion and recommendations.

- A. Indicate whether the system is completely safe for testing or whether it is safe for testing with exceptions. List hazards and any developmental or operational limitations or precautions needed to prevent injury and property damage during testing.
- B. Highlight any known safety problems that will require further investigation during testing.

Figure 6-2. Safety Release Format

Chapter 7

Test Technology

7-1. Early identification

Development and acquisition of test technology (test methods and instrumentation), like weapon systems development, involves an acquisition strategy and requires necessary lead times to reach an initial operation capability (IOC). It may require as much lead time to develop the test instrumentation, targets, and threat simulators as to develop the weapon system it will test. PM ITTS (Instrumentation, Targets, and Threat Simulators) is the Army's single manager and proponent for major test instrumentation, targets, and threat simulators (except for strategic and tactical missile defense targets which are developed by SSDC). It is important to have the early involvement of PM ITTS to effectively satisfy user needs, especially as the sophistication of the requirements increase. Where appropriate, early coordination with the FIO should be accomplished.

7-2. Test technology process

Materiel and systems under development are incorporating more and more advanced technology. With the increased complexity and sophistication of the systems, the testing requirements are more stringent, the testing problems more difficult to solve, and more time is needed to solve those problems. If the development of the system is to proceed smoothly and in a timely manner, it is imperative that test technology efforts begin prior to MS I - program initiation. Several related test technology activities, described in the following paragraphs, need to be addressed by the Army test community as early in the acquisition cycle as possible.

7-3. Advanced test technology concepts

The initial effort of the test technology process involves early identification and assessment of emerging weapons development technologies as a basis for determining future test technology requirements. This effort should be initiated with, or prior to, technology base activities and involves close interaction with Army laboratories and development commands. Test requirements (such as data parameters and corresponding data accuracies) must be determined and compared with existing capabilities in order to identify and assess test deficiencies. The deficiencies are provided as inputs to methodology, instrumentation, and target development programs as appropriate.

7-4. Test methodology

Test methodology investigations should precede instrumentation or target developments and identify what methods or techniques are needed to properly test the weapon systems or materiel. When appropriate, the testing methods might be established as standard test procedures so the results of tests conducted at different times or places can be compared and assessed. The identification of needed test instrumentation can be the results of test methodology investigations.

7-5. Instrumentation development

Instrumentation development is necessary only when existing instrumentation within the Army or industry cannot collect the required data. To meet the testing requirements, existing range instrumentation might be modified or new instrumentation developed. The modifications and/or developments can be accomplished in-house or under contract. New instrumentation that requires using the radio frequency spectrum must be coordinated and approved in accordance with AR 5-12. See DA Pam 73-1 for details.

7-6. Targets and threat simulators

The successful testing of a weapon system is dependent not only on using proper test instrumentation but also on whether the system is tested in a proper threat environment. If the actual threat system is not available to support required testing, the use of a surrogate target or threat simulator should be used. The surrogate target or threat simulator must realistically represent applicable characteristics of the actual threat system. The degree of fidelity required will

change depending upon the materiel system under test and the type of test that is being conducted. Targets and threat simulators must be validated as properly replicating the threat and accredited for the particular test in which they are being used. Refer to DA Pam 73-1 for details.

7-7. The Army Test Facilities Register

The Army Test Facilities Register (TESTFACS) identifies and describes testing capabilities within the U.S. Army. The register provides information about major test facilities and major instrumentation test equipment. Further information regarding TESTFACS is reflected in DA Pam 73-1, Chapter 11.

7-8. Technology Development and Acquisition Program

TECOM, as the Army's developmental tester, executes the Technology Development and Acquisition Program (TDAP). Through this process, TECOM researches, develops, and acquires instrumentation and develops new and improved test technology to increase the efficiency, validity, and reliability of developmental testing.

a. TECOM manages the Army's test technology development and acquisition programs by establishing and improving test technology processes continuously to meet testing requirements. These processes include:

(1) Forecasting and developing test technology, concepts, test methods, prototype instrumentation, and standardized test procedures.

(2) Documenting, assessing, and prioritizing requirements for test instrumentation, instrumentation related resources, and target design, development, and acquisition.

(3) Resourcing and managing the RDT&E meteorological teams, and serving as point of contact for meteorological support to RDT&E.

b. TECOM uses a systems engineering approach to technology development and acquisition. All technology shortfalls are linked to specific existing or proposed test facilities. The entire TDAP process is automated to accept inputs (facility requirements, descriptions of shortfalls associated with those facilities, and specific information on projects designed to eliminate those shortfalls) from TECOM's test centers, prioritizes those inputs, and forms a project funding priority based on TECOM customer needs.

c. Close coordination with PM ITTS, the Army's single point of contact for managing major instrumentation target and threat simulator acquisition, ensures effective development and acquisition of test technology. For managing tactical and strategic ballistic missile targets, instrumentation, and range planning, close coordination with USASSDC is required.

d. TECOM also interfaces with the T&E Reliance and Investment Board (TERIB). The TERIB consists of a Secretariat from the Joint Commanders Group for T&E (JCG(T&E)) and ten technical experts: Air Combat; Land Combat; Sea Combat; Space Combat; Common Range Instrumentation; Electronic Combat/Command, Control, Communications, Intelligence; Armament and Munitions; Targets; Test Environments; and Information Systems Testing. The TERIB Secretariat facilitates, on a day-to-day basis, reliance activities and functions as the administrative arm of the JCG(T&E). The anticipated planning and review cycle for developing Test Capability Master Plans by the lead service or agency, conducting required levels of review (TERIB, JCG(T&E), Service, and OSD), and building the Test Resource Management Plan is a three-year cycle which begins with yearly data calls. This process ultimately yields a DOD master plan in time to provide guidance for the upcoming program objective memoranda. TECOM supports the TERIB process by submitting its major instrumentation programs for review via the Technology Development and Acquisition Process.

Appendix A References

Section I Required Publications

AR 5-12

Army Management of the Electromagnetic Spectrum. (Cited in para 7-5)

AR 15-38

Test Schedule and Review Committee. (Cited in para 5-10.)

AR 37-100

Account/Code Structure. (Cited in paras 2-10 and 2-11.)

AR 40-10

Health Hazard Assessment Program in Support of the Materiel Acquisition Process. (Cited in figures 5-1, 6-1, and para 6-7.)

AR 70-1

Army Acquisition Policy. (Cited in paras 1-1, 2-21, and 2-22.)

AR 70-25

Use of Volunteers as Subjects of Research. (Cited in para 6-10 and figure 6-1.)

AR 70-38

RDT&E of Materiel for Extreme Climatic Conditions. (Cited in paras 6-11 and 6-23.)

AR 70-69

Major Range and Test Facility Base. (Cited in paras 2-5.)

AR 73-1

Test and Evaluation Policy. (Cited in paras 1-2, 2-4, 2-5, 2-12, 2-26, 2-29, 4-1, 4-8, 4-19, and 6-11.)

AR 200-2

Environmental Effects on Army Actions. (Cited in paras 6-14, 6-35, and 6-36, and figure 4-2.)

AR 385-16

System Safety Engineering and Management. (Cited in paras 6-8, 6-9, and figures 4-2 and 5-1.)

AR 700-127

Integrated Logistics Support. (Cited in paras 4-15, 6-5, and 6-6, and figure 5-1.)

DA Pam 70-3

Army Acquisition Procedures. (Cited in paras 2-23 and 6-1)

DA Pam 73-1

Test and Evaluation in Support of System Acquisition. (Cited in paras 2-4, 2-5, 2-6, 2-28, 4-7, 4-12, 4-13, 4-16, 5-4, 5-11, 6-1, 6-5, 7-5, 7-6 and 7-7.)

DA Pam 73-2

Test and Evaluation Master Plan Guidelines. (Cited in paras 2-7 and 5-11.)

DA Pam 73-3

Critical Operation Issues and Criteria Procedures and Guidelines. (Cited in para 3-6.)

DA Pam 73-6

Live Fire Test and Evaluation Guidelines. (Cited in paras 2-9, 2-20, 4-20, 5-5, 5-6, and 5-7.)

DA Pam 385-16

System Safety Management Guide. (Cited in paras 6-8.)

DA Pam 700-28

Integrated Logistic Support Program Assessment Issues and Criteria. (Cited in para 4-15.)

Section II Related Publications

DODD 5000.1

Defense Acquisition

DOD 5000.2-M

Defense Acquisition Management Documentation and Reports

DODD 3200.11

Major Range and Test Facility Base

DODI 8120.2

Life-Cycle Management of Automated Information Systems

AR 40-60

Policies and Procedures for the Acquisition of Medical Materiel

AR 70-6

Management of Army Research, Development, Test and Evaluation Appropriation

AR 70-44

DoD Engineering for Transportability

AR 70-47

Engineering for Transportability

AR 70-60

Army Nuclear Survivability

AR 70-62

Air Worthiness Qualification of U.S. Army Aircraft Systems

AR 70-71

Army NBC Survivability

AR 70-75

Survivability of Army Personnel and Materiel

AR 71-9

Materiel Objectives and Requirements

AR 381-11

Threat Support to U.S. Army Force, Combat, and Materiel Development

AR 385-62

Regulations for Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat

AR 385-63

Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat

AR 602-2

Manpower and Personnel Integration

AR 702-3

Army Materiel Systems Reliability, Availability, and Maintainability

AR 700-86

Life Cycle Management of Clothing and Individual Equipment.

MIL-STD 810

Environmental Test Methods and Engineering Guidelines

Section III**Prescribed Forms**

This sections contains no entries.

Section IV**Referenced Forms**

This section contains no entries.

Appendix B**Department of Army Test Facilities****B-1. Introduction**

a. This appendix provides a synopses of DA test facilities for quick reference. More detailed information on the capabilities may be obtained from the test facility or its parent command. See Chapter 4, paragraph 4-24c, for addresses and points of contact.

b. The Army maintains and operates six of the DOD Major Range and Test Facility Base (MRTFB) activities. The U.S. Army Space and Strategic Defense Command (SSDC) operates the Kwajalein Missile Range, and the U.S. Army Test and Evaluation Command (TECOM) operates the remaining five MRTFB activities (U.S. Army Aberdeen Test Center, U.S. Army Dugway Proving Ground, U.S. Army Electronic Proving Ground, U.S. Army White Sands Missile Range, and U.S. Army Yuma Proving Ground) as well as two other test facilities (U.S. Army Aviation Technical Test Center and U.S. Army Redstone Technical Test Center). A synopsis of each follows.

B-2. Aberdeen Test Center

U.S. Army Aberdeen Test Center (USAATC), Aberdeen Proving Ground, Maryland. USAATC provides a single location where an item can be subjected to a full range of tests from automotive endurance and weapons performance through environmental extremes to full-scale live-fire vulnerability. USAATC is designated as a Federal Laboratory which promotes technology transfer and dual-use partnership initiatives with industry. Testing is conducted on both full systems and system components and includes weapons, combat and general purpose vehicles, automotive technologies, armor, ammunition components, general support equipment, individual equipment, surface and underwater marine systems/ships, mobile generators, night vision devices, bridges, mines, uniforms, boots, sensors, communication systems and robotics. The diverse mission also includes nuclear simulation, vulnerability/survivability testing, flammability testing, and crash testing. USAATC offers numerous exterior and interior firing ranges, world renowned automotive course, environmental chambers which simulate temperature conditions, two underwater explosion ponds, sophisticated nondestructive test facilities, and an extensive industrial complex which includes maintenance and experimental fabrication capabilities. Experienced personnel also conduct and/or support tests at other locations throughout the world with extensive mobile instrumentation.

B-3. Aviation Technical Test Center

The U.S. Army Aviation Technical Test Center (USAATTC), Fort Rucker, Alabama. USAATTC tests performance, suitability, and airworthiness of fixed and rotary wing aircraft, aircraft components, subsystems, and related ground support equipment. Facilities include a static engine test cell, inflight performance recorders, and ranges for the firing of aircraft weapons systems. Facilities also include an airworthiness qualification test site at Edwards Air Force Base for

the conduct of safety and technology test and evaluation of aircraft systems and subsystems.

B-4. Dugway Proving Ground (DPG).

The U.S. Army Dugway Proving Ground (DPG), Dugway, Utah. DPG tests chemical and biological materiel, smoke, obscurants, and incendiary devices, artillery and mortars, and tropic natural environmental effects on all materiel. Facilities include instrumented outdoor test grids to measure effectiveness of smokes, obscurants, and dispersal of chemical munitions using simulants; chemical and biological laboratories; an indoor test chamber to subject systems as large as a tank to chemical, biological, and environmental challenges; and mortar and artillery ranges out to 65,000 meters.

B-5. Electronic Proving Ground

U.S. Army Electronic Proving Ground (USAEPG), Fort Huachuca, Arizona. USAEPG tests systems with regard to communications, command and control, optics and electro-optics, intelligence, electronic warfare, avionics, and TEMPEST. Facilities include an instrumented test range, an electromagnetic environmental test facility, environmental facilities to satisfy the requirements of MIL-STD 810, a stress loading facility to provide a threat electromagnetic environment and measure the full load performance of communications systems, and many unique specialized facilities for testing of antennas, radars, remotely piloted vehicles, and computer software.

B-6. Kwajalein Missile Range

Kwajalein Missile Range (KMR), U.S. Army Kwajalein Atoll (USAKA), Republic of the Marshall Islands. KMR is isolated location makes it ideal for testing the full performance envelope of developmental and operational ballistic missile systems with minimal safety and environmental constraints. KMR provides range radar tracking, impact scoring, recovery, and telemetry data collection for intercontinental and theater ballistic missiles, orbital objects, and reentry vehicles. Facilities include a broad range of ground and mobile instrumentation, radar tracking and imaging, telemetry, and splash detection radars, and large aperture optical sensors. Intercontinental ballistic missiles can be launched from CA (4,840 miles), intermediate-range missiles from Hawaii (2,430 miles), shorter range theater missile defense-type missiles from Wake Island (730 miles), and other alternate launch sites (250-450 miles). The natural configuration of the atoll (more than 90 islands forming the world's largest lagoon) facilitates tracking and recovery of reentry vehicles and local launches with minimal safety and environmental constraints.

B-7. Redstone Technical Test Center

U.S. Army Redstone Technical Test Center (USARTTC), Redstone Arsenal, Alabama. USARTTC is designated as a Reliance Specialty Site and serves as the Army's small missile and rocket tester and center of expertise for weapon system component and subsystem testing. Facilities include fully instrumented flight ranges up to 8 km, 2 dynamic warhead test sled tracks, static rocket motor test stands, and a full range of dynamic, climatic, electromagnetic and lightning facilities for testing missiles and other DOD weapon systems. A 5 km, fully equipped test range including a 70-foot test platform, is also available for performing testing of lasers and weapon system sensors under captive flight testing of lasers and weapon system sensors under captive flight or dirty battlefield conditions. Highly automated laboratory facilities are available for testing (under realistic climatic and dynamic conditions) all types of weapon components and subsystems utilizing electro-optical (ultra-violet, visible, infrared), electronic (digital and analog), electro-mechanical, mechanical, and optical technologies. State-of-art modeling and simulation, and hardware-in-the-loop techniques coupled with extensive computing and networking facilities permit the real and nonreal time interaction of component/subsystem test results with high fidelity weapon systems models allowing for realistic system level performance assessment in a laboratory environment.

B-8. White Sands Missile Range

U.S. Army White Sands Missile Range (WSMR), New Mexico. WSMR tests missile systems and related materiel, air defense systems, laser weapons systems, and nuclear effects on all systems. Facilities include on-range and off-range missile launch facilities providing up to 800 miles over-land trajectory; flight ranges highly instrumented with radars, cinetheodolites, telemetry, optics, laser trackers and command, control and command destruct systems; a laser test range; and target drone control facility. Specialized environmental facilities provide nuclear effects, electromagnetic radiation, microbiological, climatic, and dynamic test environments.

B-9. Yuma Proving Ground

U.S. Army Yuma Proving Ground (YPG), Yuma, Arizona. YPG tests long range artillery, automotive systems, armored vehicles and armament, aircraft armament and fire control systems, air delivery and air transport systems, aircraft and vehicle navigation systems, target acquisition and sensor systems, remotely piloted vehicles, and natural desert environmental effects on all weapons systems and materiel. Facilities include fully instrumented land and water air delivery drop zones, firing ranges from small arms to artillery out to 75,000 meters, air to ground aircraft armament range, tank gunnery range, navigation system range, and a full array of ground vehicle mobility test courses. YPG is the Army's natural environmental test activity. The hot-dry natural desert environment provides diverse terrain representative of almost all of the world's desert areas. Facilities also include two remote sites for tropic and cold weather testing. A remote test site in Panama tests the full range of Army weapons systems, clothing, and individual equipment for effects of operation and long term exposure in natural tropical environments. The Cold Regions Test Activity (CRTA), located at Fort Greely, Alaska, conducts basic cold environment tests on all materiel as prescribed by AR 70-38. Facilities include artillery ranges to 55,000 meters, tank ranges to 4000 meters, vehicle courses, chemical (simulant) and smoke test grids, mobile instrumentation vans, ski trails, and large expanses in which to test full systems operationally in the natural winter environment. Conditions include snow to seven feet deep, ice fog, permafrost tundra, temperatures in the -5° to -25°F range during most of the winter, with temperatures often dipping below -50°F.

Appendix C Reliability, Availability, Maintainability (RAM) Conferences

C-1. Introduction

This appendix provides guidance for the conduct of conferences for the purpose of scoring RAM data and assessing RAM data. The purpose of a RAM scoring conference is to review, classify, and charge RAM data from system level developmental and operational tests. The purpose of the RAM assessment conference is to determine the viability of aggregating individual test data bases and to determine the impact of validated corrective actions on RAM estimates prior to a major program decision. See DA Pam 70-3, section 6-C for the process for establishing and managing the Army RAM program.

C-2. RAM Scoring Conference

a. Membership. The principal scoring conference participants are the MATDEV, CBTDEV, and the independent evaluators/assessors. The operational evaluator/assessor chairs the conferences associated with operational testing and the MATDEV chairs those associated with developmental and production testing, as appropriate. The chairperson schedules all scoring conferences and is responsible for:

- (1) Administrative requirements (including preparation of minutes).
- (2) Carrying out the procedures established by the principal spokespersons.

(3) Ensuring that system contractor personnel do not attend or directly participate in RAM scoring conferences that address data intended to support evaluation/assessment of their system's operational RAM parameters.

b. Spokespersons. Each principal participating organization will designate one representative to serve as a principal spokesperson. The principal spokespersons will make up the decision making body of the scoring conference; they will perform their function within the guidelines of the agreed upon operating procedures. The principal spokespersons will not change requirements.

c. Pretest meeting. Prior to the test, the chairperson will convene a pretest meeting. The pretest meeting will follow the format of the scoring conference; usually chaired by the materiel developer, since DT normally precedes OT. It may be a separate meeting preceding all testing or it may be the initial item of business at the first official scoring conference of a given test phase. The meeting may be chaired by the independent operational evaluator, particularly when there is no DT scoring conference prior to a OT scoring conference. The four principal spokespersons and the developmental and operational testers will constitute the minimum essential membership of the pretest meeting. The pretest meeting will be conducted for the following purposes:

(1) Review and establish a common understanding of system requirements, the failure definition/scoring criteria (FD/SC), the explanation of terms, and the factors used in calculating the RAM estimates. (Examples are item life units and repair and logistics times.)

(2) Establish the minimum essential data requirements for the following:

(a) Applying the approved FD/SC.

(b) Developing estimates of RAM parameters.

(3) Identify the parent organizations of the principal spokespersons.

(4) Establish procedures for the corrective action process. These procedures must include the criteria for evaluating the effectiveness of corrective actions.

d. Incident classification and chargeability.

(1) All test incidents are scored in a two-step process using the approved FD/SC. The first step is to classify a test incident into categories, for example, mission affecting failure, type of maintenance action, and non-RAM. In the second step the incident is to be charged to the underlying cause of the incident. Scoring decisions consider the Design Reference Mission Profile (DRMP) which considers the function(s) and operating environment of a system. It is based on the operational mode summary/mission profile (OMS/MP) for the system. It provides a consistent basis for system design and test, and provides for consistency among tests used to estimate the RAM parameters.

(2) All decisions are to be made in accordance with previously established guidelines for operation. All decisions will be by majority vote of the principal spokespersons with the following exceptions:

(a) If there is no majority opinion regarding the classification and chargeability of the incident, the independent developmental evaluator/assessor will make the final decision (tie-breaking vote) during a scoring conference for DT, contractor test, and production phase testing.

(b) The independent operational evaluator, usually the U.S. Army Operational Evaluation Command (OEC), will make the final decision (tie-breaking vote) for OT scoring conferences.

(3) Participation by any of the observers will be through or at the request of the chairperson or one of the principal spokespersons. The principal spokespersons will score all incidents in accordance with the approved FD/SC. Differing opinions will be formally documented in minutes of the meeting based on the written input of the dissenting principal spokesperson(s). An incident may be left unscored or tabled only if the majority of the principal spokespersons feel that additional data regarding the incident is necessary to support the incident classification and chargeability decision. Incidents previously scored may be reopened if a principal spokesperson can establish that additional data on the incident has been gathered, and

the chairperson or a majority agrees to return to that incident. Even if the incident is not reopened, the additional data may be entered into the minutes of the meeting.

e. Responsibility for corrective action

(1) As part of the evaluation of test incidents, the scoring conference will designate responsibility for investigating the incident, initiating corrective action as necessary, and reporting results. Activities normally responsible for corrective action include:

(a) The materiel developer for contractor and government furnished equipment (commonly referred to as CFE and GFE). The CFE and GFE hardware and software are included.

(b) The tester for test conditions not representative of the field environment.

(c) The combat developer for training and operational concepts.

(2) Each activity will initiate appropriate corrective action on chargeable failures and provide a detailed analysis of these incidents. The materiel developer will take the lead in the analysis of failure incidents, and will sponsor corrective action reviews in accordance with scoring conference procedures, as appropriate.

f. Changes to failure definition and scoring criteria.

(1) The spokespersons cannot make any changes to the approved FD/SC that in any way modifies the mission-essential functions or RAM parameters. Any changes to the FD/SC affecting these functions and parameters must be:

(a) Formally coordinated and approved through the RAM Rationale Report approval process.

(b) Provided to the testers and Army Logistician.

(2) If such changes are made after the beginning of test, all incidents are scored according to the revised FD/SC to assess the effect of the change.

g. Distribution of test data.

(1) The appropriate test activity will distribute incident reports and necessary maintenance data for all incidents to be scored at a scoring conference. This data will be distributed at least two weeks before the conference (or as agreed upon at the pretest meeting). Recognizing that the data may be unverified or incomplete, the test activity will advise the scoring conference members of any changes to, or amplification of the data.

(2) For efficient operation of the scoring conference, each principal spokesperson will, before attending the conference, review the initial scoring determination for each incident, and identify areas of disagreement. If any spokesperson has not received the test data, the scoring conference will be delayed or postponed until each spokesperson has had sufficient time to review the data.

h. Conduct of scoring conferences.

(1) Scoring conferences should be conducted by telephone or correspondence when possible, particularly when only a few incidents are to be considered. A formal conference will be held at the request of any of the principal spokespersons.

(2) Scoring conferences will be scheduled to accommodate the principal spokespersons. A scoring conference requires at least three principal spokespersons. If one of the principal spokespersons elects not to attend, the other three spokespersons will conduct the conference as a three member deliberation with majority rule. The absent member will recognize the scoring conference results.

(3) The following is Army policy regarding system contractor participation in developmental test and evaluation activities:

(a) The participation of system contractor personnel at scoring conferences will depend on whether the RAM data established at the conference is intended to support evaluation (assessment) of system operational RAM parameters. Contractor personnel may not participate in scoring conferences where the data will be used to evaluate/assess operational RAM values.

(b) Discussions with system contractor personnel may be necessary to ensure full technical understanding of test incidents; however, discussions with system contractor personnel will be held separately from the scoring conference. A formal written record will be kept by the project manager of all separate government/system contractor discussions of test incidents to include issues, system contractor positions, casual analysis, and any other pertinent data.

(c) Developmental tests identify problems, the correction of which assists in achieving RAM-D maturity through problem analyses, corrective action and corrective action verification accomplished in a timely manner. These factors suggest that engineering level discussions with system contractor personnel are encouraged/required. The discussions should, in general, take place prior to or during the scoring conference; however, contractor personnel should NOT be physically present during the formal voting/assessment period. The system contractors should speak primarily at the request of the materiel developer spokesperson. The chairperson will be responsible for maintaining reasonable participation by all observers. The restriction noted above still applies.

(d) In those DT cases where it is known that testing will be conducted under conditions similar to the OMS/MP, stresses, environmental conditions, test support and system configuration to OT, and an operational test is to be conducted during the same phase, OPTEC will notify the AMC that the DT results are to be combined with OT results. If agreed to by AMC, system contractor participation in the DT scoring conferences will be the same as for OT scoring conferences.

i. Final test data base. At the final scoring conferences, both DT and OT, which address data to be used in a decision review, information concerning any previously scored test results will be reviewed in accordance with the established procedures. A final test data base identifying test length and test incidents will be established.

j. Corrective action process.

(1) A corrective action process will be conducted to eliminate or reduce failure modes identified during a test. The status of corrective actions will be provided to the scoring conference spokespersons and the Army logistician. Corrective actions then may be considered during the RAM assessment conference. Five steps will be used in evaluating the corrective actions:

(a) Failure analysis adequacy.

(b) Appropriateness of corrective action.

(c) Demonstration of corrective action by test.

(d) Verification of future implementation of corrective action.

(e) Evaluation of effectiveness of corrective action.

(2) Each activity assigned responsibility for corrective action will report on the actions that have been taken to correct each failure mode. While the test is in progress, the responsible activities will provide progress made on the first three tasks cited above. A final assessment of all five steps will be made at the RAM assessment conference.

(3) Corrective actions will not be considered in the initial classification of incidents. Corrective actions can be considered when establishing the final test data base.

C-3. Assessment Conference

The RAM assessment conference procedures presented herein were developed to allow a fair determination of RAM data bases. The procedures provide a disciplined set of rules for conducting a RAM assessment conference. The general policies related to assessment conferences are provided in DA Pam 70-3.

a. Corrective action process

(1) A corrective action process will be conducted to eliminate or reduce failure modes identified during a test. The status of corrective actions will be provided to the RAM assessment conference spokespersons and the Army logistician. Five steps will be used in evaluating the corrective actions:

(a) Failure analysis adequacy.

(b) Appropriateness of corrective action.

(c) Demonstration of corrective action by test.

(d) Verification of future implementation of corrective action.

(e) Evaluation of effectiveness of corrective action.

(2) Each activity assigned responsibility for corrective action will report on the actions that have been taken to correct each failure mode.

b. Objectives. The objectives of the RAM assessment conference are as follows:

(1) Establish a common test data base for calculation of demonstrated RAM estimates.

(2) Determine demonstrated RAM estimates for comparison with the ORD and contract specifications.

(3) Establish adequacy of integrated diagnostics.

c. Procedures. To meet the objectives set forth, the conference will take the steps shown below:

(1) The DRMP will be used to review the test profiles and test results to identify test phases or configurations that are relevant for use in determining RAM estimates. The test and test data base may be partitioned for analysis according to environmental conditions, stresses, and by systems, subsystems, or major items. A test designed in accordance with the DRMP eliminates the need for further adjustment. If the DRMP is not followed, procedures (to determine RAM estimates) based on the relationship between DRMP and test profiles will be used.

(2) Aggregation of data will be considered. This effort will address all RAM parameters in the requirements document. When aggregation is not feasible, both DT and OT results will be presented at subsequent decision reviews. The presentation will include an explanation of significant differences. If DT and OT data are not aggregated, the principal spokesperson must provide a detailed explanation of the reasons for not aggregating in the conference minutes.

(3) The conference will determine which method of assessment provides the most accurate representation of the system in its configuration at the end of the test. For tests conducted in accordance with the DRMP and with a fixed system configuration, no adjustment of the scored data will be considered. The demonstrated estimates will be based on unmodified scoring conference results. For tests conducted with a changing configuration, the techniques shown below will be considered and may be used in the determination of demonstrated RAM values.

(a) Reliability growth analysis. Reliability growth tracking techniques will be attempted for assessing the demonstrated reliability of the tested system. These techniques provide an objective means for assessing the impact that fixes have had on the reliability of the hardware tested. These techniques may be applied to systems, subsystems, or major items. The analysis may be further divided according to environment or other test conditions. MIL-HDBK-189, Reliability Growth Management, will be used as a principal source of statistical methodology for assessing the reliability growth aspects of Army programs.

(b) Engineering analysis. A technique that may be employed involves an engineering assessment of the final test data base. This technique makes use of engineering judgement and test data in assessing the impact of fixes on the RAM of the configuration. In this method, the principal spokespersons will determine if the classification status of corrected failure modes has changed based on the five steps shown above. A failure identified as 'not relevant' will not be used for computing the demonstrated estimate if a majority of the principal spokespersons agree that there is concrete evidence that a failure mode will not recur in the operational environment, and the fix does not create any new failure modes. If the failure rate of a particular mode has been reduced to a lower rate (but the mode has not been eliminated), the failure rate observed after the change will be prorated for the entire test length. Only fixes that have been verified by test (component, subsystem, or system) as effective may be used to reduce the number of relevant failures.

(4) The goals of the RAM assessment conference are to establish:

(a) A common data base used for calculation of demonstrated estimates.

(b) Estimates of all RAM requirements (parameters) in the ORD.

(5) Attempts should be made to achieve the objectives of the RAM assessment conference by telephone or correspondence whenever possible, but a conference will be held at the request of any of the principal spokespersons.

(6) The RAM assessment conference is conducted under the guidelines for scoring conferences, except that no tie breaking vote exists. The RAM assessment conference will be chaired by the

independent operational evaluator. Each of the four organizations providing spokespersons to the scoring conference will designate a spokesperson for the RAM assessment conference. Any changes to the data base must be by majority opinion. In the event that no majority opinion is reached, each agency will report its own assessment.

(7) In the event of a significant difference among the spokespersons, it is the responsibility of each spokesperson to advise their headquarters of the magnitude of the difference and basic reasons for it. Unresolved differences will be reported at a decision review.

(8) The results of the RAM assessment conference are:

(a) The common data base under which all assessment for achievement of RAM requirements will be evaluated.

(b) Demonstrated RAM estimates that serve as a baseline for all independent assessments.

(c) To identify adequacy of integrated diagnostics. Preliminary assessments, based on individual scoring conference results, must be accompanied by a statement that shows, in effect, that formal evaluation is still underway and that the preliminary values presented are not the final or the official assessment of RAM performance. The proper fora to identify and resolve differences are the scoring and RAM assessment conferences. Where differences exist (such as in scoring or data base determination) between individual agency and the RAM assessment conference determination, a failure-by-failure explanation will be provided in IERs/IARs or test reports. Unresolvable differences will be elevated to appropriate headquarters before any decision review.

(9) Independent RAM estimates may be developed by the independent evaluators/assessors, materiel developer, and combat developer, based on analysis of the test data base in an appropriate manner. Any deviations from the agreed upon categorization or demonstrated estimates will be clearly identified to provide a well established audit trail. Reports and decision review briefings will address the relationship of the independent estimates to the demonstrated estimates. The reports and briefings will provide supporting rationale for the independent estimates. Independent estimates may result from different incident assessment criteria, projections based on corrective actions, differences in analytical techniques used, or any other variations in data base presentations. Independent estimates are valuable in gaining maximum insight into the RAM data base and the performance and potential of the system.

(10) When the requirements have not been demonstrated, projected RAM estimates will be developed before the next phase of the program. The independent developmental evaluator/assessor in conjunction with the materiel developer will develop projected values. Projected values will be developed using test data, engineering judgement, and other pertinent information to estimate RAM performance expected at the beginning of the next phase or in field operations. The materiel developer will provide projected values to the scoring conference participants and will define the rationale used to develop them. A projection can account for proposed fixes to be incorporated after the end of test, and for late fixes that were incorporated near the end of the test period. However, the projection may not be fully reflected in the demonstrated RAM values because of limited test exposure. The operational evaluator will report to the Vice Chief of Staff of the Army an assessment of the effectiveness of the incorporated and proposed fixes. All independent evaluators/assessors will report projected RAM values.

(11) If the point estimate for a RAM parameter is below the threshold, the assessment conference will conduct analyses to determine if a threshold breach has occurred. Inputs to this analysis include:

(a) Engineering estimates from design disciplines (for example, thermal analysis, worst case analysis, failure modes effects, and criticality analysis).

(b) Contractor test results (for example, reliability demonstration, test-analyze-and-fix (TAAF), component/subsystem testing, factory screens and acceptance tests).

(c) DT point estimates and confidence intervals.

(d) OT point estimates and confidence intervals.

(12) Since integrated diagnostics do not detect and isolate all

system failures, relevant failures attributed to integrated diagnostics will require adjustment to account for allowed false alarm rates.

d. Contractor involvement. System contractor personnel will not participate in RAM assessment conferences that address data intended to support evaluation or assessment of the system's operational RAM parameters.

Appendix D Summary of Documents

Developmental test and evaluation planning documents are shown in table D-1.

Table D-1
Test and evaluation planning

Document: Detailed Test Plan

Reference: AR 73-1

Responsible Agency: Test Organization

Summary: The DTP provides explicit instructions for the conduct of tests/subtests. It is derived from and implements the TDP, and governs test control, data collection, data analysis, and the necessary administrative aspects of the test program. There may be one or several DTPs depending on the complexity of the program, the number of test sites or test facilities providing data. The DTP is coordinated with evaluators/assessors and with other TIWG members, if necessary, to ensure that it accurately and completely reflects the requirements for data, information, and analysis set forth in the IEP/IAP. DTPs for LFTE are approved by the DUSA(OR).

Document: Environmental Assessment (EA)

Reference: AR 200-2

Responsible Agency: Materiel Developer

Summary: Addresses new and continuing activities where the potential exists for measurable degradation of environmental quality. This document concludes with either a Finding of No Significant Impact (FNSI) or a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS). The EA, FNSI, and NOI provide for public disclosure.

Document: Environmental Impact Statement (EIS)

Reference: AR 200-2

Responsible Agency: Materiel Developer

Summary: If the EA shows that the system will impact the environment adversely, or is controversial, an EIS is prepared. It provides full disclosure to the public on all issues associated with a Federal action that has the potential to significantly impact the natural environment. If required, testing is performed to identify and quantify the environmental quality issues.

Document: Five-Year Test Program

Reference: AR 15-38; AR 73-1

Responsible Agency: OPTEC

Summary: The FYTP is a compendium of approved OTPs. The document identifies validated requirements to support operational tests as well as those DTs for which operational troops are required. It is a tasking document for the current and budget years and provides test planning guidelines for the out years.

Document: Health Hazard Analysis Report (HHAR)

Reference: AR 40-10

Responsible Agency: Materiel Developer

Summary: The HHAR is the formal document used to provide an analysis and assessment of health hazard issues. It also provides recommendations for eliminating or controlling hazards. It is required for the development of the SAR.

Document: Human Factors Engineering Analysis (HFEA)

Reference: AR 602-1

Responsible Agency: AMC

Summary: The HFEA summarizes the HFE issues based on the results of human engineering analyses, system testing, and evaluation. The T&E input should be in the HFE design, soldier-machine interface, system safety, methodology, data, and reports areas.

Document: Independent Evaluation Plan/ Independent Assessment Plan

Reference: AR 73-1

Table D-1

Test and evaluation planning—Continued

Responsible Agency: Independent Developmental Evaluator/ Assessor

Summary: The IEP/IAP details all aspects of developmental evaluation responsibilities relative to the system throughout its acquisition cycle. The IEP/IAP supports the TEMP by addressing the issues for testing; describing evaluation of issues which require data from sources other than tests; stating the technical parameters; identifying data sources; providing the approach to the evaluation; and identifying program constraints.

Document: Independent Evaluation Report/Independent Assessment Report

Reference: AR 73-1

Responsible Agency: Independent Developmental Evaluator/ Assessor

Summary: IER/IAR provides the independent evaluation of the system and is based on test data, reports, studies, simulations, and other appropriate sources. It contains the evaluator's assessment of the parameters, conclusions, and position on the future capability of the system to fulfill the approved requirements. IER/IAR will contain an assessment of the adequacy of testing, the need for additional testing, and will identify program constraints and their impact on the evaluation. The safety confirmation is part of the IER/IAR.

Document: Integrated Logistics Support Plan

Reference: AR 700-127

Responsible Agency: Materiel Developer

Summary: Outlines the entire ILS strategy for a materiel system.

Document: New Equipment Training Plan

Reference: AR 350-35

Responsible Agency: TRADOC/Materiel Developer.

Summary: Sets training dates for test player instructor evaluation and test personnel and training strategy to support unit fielding.

Document: Outline Test Plan

Reference: AR 15-38; AR 73-1

Responsible Agency: Tester

Summary: The OTP is a formal resource document submitted to the TSARC if developmental testing requires user troops. The document contains a listing of the resources required and the administrative information necessary to support the test. The document also contains the critical test issues, test conditions, a brief scope, suspense dates, test milestones, and cost estimates.

Document: Record of Environmental Consideration

Reference: AR 200-2

Responsible Agency: Materiel Developer

Summary: Briefly describes a proposed action and contains a checklist explaining why further analysis is not necessary. It is used when a categorical exclusion applies or there is existing environmental documentation on the item/system/action.

Document: Safety Assessment Report (SAR)

Reference: AR 385-16; AR 40-10; AR 73-1

Responsible Agency: Materiel Developer

Summary: The SAR contains data and information relative to personnel and equipment hazards inherent in the system and any associated operation and maintenance hazards. Government system level testing cannot begin until the SAR is received, reviewed, and accepted by the test organization.

Document: Safety Confirmation

Reference: AR 73-1; AR 385-16

Responsible Agency: TECOM

Summary: The Safety Confirmation provides the safety findings and conclusions and states where the specified safety requirements/ specifications were met. It indicates if the item is safe for its intended use and evaluates the risk of proceeding to the next phase of the acquisition cycle. The Safety Confirmation is included as part of the developmental

Table D-1
Test and evaluation planning—Continued

IER/IAR.

Document: Safety Release

Reference: AR 73-1; AR 385-16

Responsible Agency: TECOM/HSC/MRDC/ISC

Summary: The SR is required before involving soldiers in any testing. It documents the precautions that must be taken by the soldier to avoid system damage and personal injury. The SR is based on the results of DT and data presented in the SAR.

Document: System MANPRINT Management Plan

Reference: AR 602-2

Responsible Agency: TRADOC and Materiel Developer

Summary: Summarizes program/plan to address MANPRINT concerns throughout the materiel acquisition process.

Document: System Safety Management Plan

Reference: AR 385-16

Responsible Agency: Materiel Developer

Summary: Implements system safety engineering program that will assess the safety of the system, and assures that the system meets the user's safety requirements and regulatory safety standards.

Document: System Support Package Components List

Reference: AR 700-127

Responsible Agency: Materiel Developer

Summary: A list of the components in the SSP provided to the TIWG/ILS Management Team for review and furnished 60 days before the test begins

Document: System Training Plan

Reference: AR 350-35

Responsible Agency: TRADOC

Summary: Outlines training strategy for a developing system. Sets milestones for development of the Training Product.

Document: Test & Evaluation Master Plan

Reference: DODI 5000.2 DOD 5000.2-M AR 73-1

Responsible Agency: Materiel Developer

Summary: The TEMP is the basic planning document for all T&E related to a particular system acquisition and is used in planning, reviewing, and approving T&E activities. It must be approved prior to the start of any testing. The TEMP addresses T&E to be accomplished in each phase of the life cycle.

Document: Test Design Plan

Reference: AR 73-1

Responsible Agency: Independent Developmental Evaluator/
Assessor

Summary: The developmental TDP is a formal document that supports the developmental IEP and the TEMP. It is responsive to the critical technical parameters and includes a developmental test design, a description of required tests, the conditions under which the system is to be tested, and a statement of test criteria and methodology. The IEP and TDP may be combined into a single document at the discretion of the evaluator. For programs assessed by TECOM, the IAP includes the TDP.

Document: Test Incident Report

Reference: AR 73-1; DA Pam 73-1

Responsible Agency: Test Organization & PM

Summary: TIRs are used as the medium to provide the results of any incident occurring during test, report the results of subtests, and serve as interim reports. TIRs are reported through the ATIRS data base and include corrective action data, if required, provided by the PM.

Document: Test Report

Reference: AR 73-1

Table D-1
Test and evaluation planning—Continued

Responsible Agency: Test Organization

Summary: The Test Report (TR) is a formal document of record which reports the data and information obtained from the conduct of test and describes the conditions which actually prevailed during test execution and data collection. For ACAT IV systems which do not have DOT&E oversight, an expanded TR may be written. An expanded TR is a test report with evaluative content which is endorsed by the evaluator in lieu of a separate evaluation.

Document: Transportability Report

Reference: AR 70-44; AR 70-47

Responsible Agency: Materiel Developer

Summary: The Transportability Report is prepared for transportability problem items. All information is provided for a comprehensive transportability engineering analysis is submitted to the Military Traffic Management Command Transportation Engineering Agency.

Glossary

Section I Abbreviations

ACAT

acquisition category

ACTD

Advanced Concept Technology
Demonstration

AIS

automated information system

AMC

U.S. Army Materiel Command

AMSAA

U.S. Army Materiel Systems Analysis
Activity

APTU

Army Participating Test Unit

ARL

Army Research Laboratory

ASARC

Army Systems Acquisition Review Council

ASA(RDA)

Assistant Secretary of the Army (Research,
Development, and Acquisition)

ATD

Advanced Technology Demonstration

ATIRS

Army Test Incident Report System

BET

Baseline Evaluation Test

C3I

command, control, communications, and
intelligence

C4I

command, control, communications, com-
puters, and intelligence

CE

continuous evaluation

CECOM

U.S. Army Communications-Electronics
Command

CIE

clothing and individual equipment

COEA

Cost and Operational Effectiveness Analysis

COIC

Critical Operational Issues and Criteria

CPT

comparison test

CTEA

Cost and Training Effective Analysis

CTP

Critical Technical Parameter

DA

Department of the Army

DAB

Defense Acquisition Board

DCSLOG

Deputy Chief of Staff for Logistics

DISA

Defense Information Systems Agency

DMWR

Depot Maintenance Work Requirement

DOD

Department of Defense

DOT&E

Defense Director of Operational Test &
Evaluation

DT

developmental test

DT&E

developmental test and evaluation

DTP

Detailed Test Plan

DTRR

Developmental Test Readiness Review

DTRS

Developmental Test Readiness Statement

DUSA(OR)

Deputy Under Secretary of the Army (Opera-
tions Research)

E3

electromagnetic environmental effects

ECP

engineering change proposal

EDT

engineering development test

EMD

Engineering and Manufacturing Development

FAT

First Article Test

FIO

foreign intelligence officer

FORSCOM

U.S. Army Forces Command

FPT

Follow-on Production Test

FYTP

Five-Year Test Program

HHA

health hazard assessment

HHAR

Health Hazards Assessment Report

HUC

Human Use Committee

IAP

Independent Assessment Plan

IAR

Independent Assessment Report

IEP

Independent Evaluation Plan

IER

Independent Evaluation Report

ILS

integrated logistics support

ILSMIS

ILS Management Information System

ILSMT

ILS Management Team

ILSP

Integrated Logistics Support Plan

IOC

Initial Operations Capability

IOT

initial operational test

IOT&E

Initial Operational Test & Evaluation

IPR

In-Process Review

IPT

Integrated Product Team

ISC

U.S. Army Information Systems Command

ITOP

international test operating procedures

ITPS

Integrated Test Program Schedule

ITTS

instrumentation, targets, and threat simulators

JCG(T&E)

Joint Commanders' Group (Test &
Evaluation)

JIEO/JITC

Joint Interoperability and Engineering Orga-
nization/Joint Interoperability Test Command

KMR Kwajalein Missile Range	OT operational test	STAR System Threat Assessment Report
LCSMM life cycle system management model	OTP Outline Test Plan	T&E test and evaluation
LD Logistic Demonstration	OTRR Operational Test Readiness Review	TAAF test analyze and fix
LFT live fire test	PA procurement, Army	TB Technical Bulletin
LFT&E Live Fire Test and Evaluation	PDSS post-deployment software support	TDAP Technology Development and Acquisition Program
LRIP low-rate initial production	PM Project/Product Manager	TDP Test Design Plan
MAISRC Major Automated Information System Review Council	POM program objective memorandum	TECOM U.S. Army Test & Evaluation Command
MANPRINT Manpower and Personnel Integration	POP Proof of Principle	TEMA Test & Evaluation Management Agency
MAPR Monthly Acquisition Program Review	PPT production prove out test	TEMP Test and Evaluation Master Plan
MDA milestone decision authority	PQT production qualification test	TER T&E Report
MNS Mission Needs Statement	PVT production verification test	TERIB T&E Reliance and Investment Board
MRDC Medical Research Development Command	RAM reliability, availability, and maintainability	TESTFACS Test Facilities Register
MRTFB Major Range and Test Facility Base	RDAP Research, Development and Acquisition Plan	TFT technical feasibility test
MS milestone	RDTE research, development, test and evaluation	TIR Test Incident Report
MTMC Military Traffic Management Command	REC Record of Environmental Consideration	TIWG Test Integration Working Group
NDI nondevelopmental item	RFP Request for Proposal	TM Technical Manual
NET new equipment training	SAR Safety Assessment Report	TMDE test, measurement, diagnostic equipment
OA operational assessment	SLAD Survivability/Lethality Analysis Directorate	TOP Test Operating Procedure
OMA operations and maintenance, Army	SLV survivability/lethality/vulnerability	TR Test Report
OMS/MP Operational Mode Summary/Mission Profile	SQT software qualification test	TRADOC U.S. Army Training and Doctrine Command
OPTEC U.S. Army Operational Test and Evaluation Command	SSDC U.S. Army Space and Strategic Defense Command	TSARC Test Schedule and Review Committee
ORD Operational Requirements Document	SSEB Source Selection Evaluation Board	USAMMA U.S. Army Medical Materiel Agency
OSD Office of the Secretary of Defense	SSP System Support Package	Section II Terms Army Test Incident Reporting System A data base containing all test incident reports and corresponding corrective actions

to enhance the continuous evaluation of a program.

Brassboard configuration

An experimental device (or group of devices) used to determine feasibility and to develop technical and operational data. It will normally be a model sufficiently hardened for use outside of laboratory environments to demonstrate the technical and operational principles of immediate interest. It may resemble the end-item but is not intended for use as the end-item.

Breadboard configuration

An experimental device (or group of devices) used to determine feasibility and to develop technical data. It will normally be configured only for laboratory use to demonstrate the technical principles of immediate interest. It may not resemble the end-item and is not intended for use as the projected end-item.

Critical technical parameters

The measurable objectives and thresholds to be evaluated, which establish a relationship between the operational requirements and the DT&E to be performed during each acquisition phase. Critical technical parameters are documented in Part I of the TEMP.

Developmental test

Any engineering-type test used to verify status of technical progress, verify that design risks are minimized, substantiate achievement of contract technical performance, and certify readiness for IOT. Developmental tests generally require instrumentation and measurements and are accomplished by engineers, technicians, or soldier operator-maintainer test personnel.

Developmental test readiness review

A review conducted by the PM to determine if the materiel system is ready for the PQT (as a minimum) or the information system is ready for the SQT.

Developmental test readiness statement

A written statement prepared by the chairperson of the DTRR as part of the minutes. The statement documents that the materiel system is ready for the PQT or the information system is ready for the SQT.

Independent developmental evaluator

A command or agency independent of the program manager or developing subordinate command that conducts developmental evaluations of Army systems, normally AMSAA, TECOM, or ISC.

Logistician

An Army command or agency that conducts the logistic evaluation of systems being acquired and who assures that logistics are adequately addressed in the TEMP and detailed test plans.

Program Planning Forecast

A mechanism designed to identify future developmental testing requirements, which provides a dual purpose, that is, a forecast of requirements which permits the Army to identify future test resources and a preliminary budget estimate and test schedule for the PM.

Safety release

A formal document issued by the developmental tester to the operational test organization indicating the system is safe for use and maintenance by typical user troops, and describes the specific hazards of the system based on test results, inspections, and system safety analyses.

Test Incident Report

Provides test incident data prepared by the test organization, and corrective action data prepared by the materiel developer for all critical or major incidents.

Section III

Special Abbreviations and Terms

This section contains no entries

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This index is organized alphabetically by topic and subtopic. Topics and subtopics are identified by paragraph number.

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